THE UNIVERSITY OF ALBERTA

ESSAYS ON TRANSPORTATION AND TRADE

by

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled ESSAYS ON TRANSPORTATION AND TRADE submitted by Ingrid A. Bryan in partial fulfilment of the requirements for the degree of Doctor of Philosophy.

ABSTRACT

In this dissertation the structure of liner conference freight rates and their effect on the demand for some Canadian exports is examined. The results from multiple regression analysis show that the freight rate assigned to a commodity depends on its unit value and its bulk, and to a lesser degree on the distance over which it is shipped, on competition on the liner route, and on the quantity shipped. Its freight rate is likely to be higher if it is carried by a conference which serves jointly United States and Canadian ports, than if it is carried by a conference or liner which serves Canadian ports only.

It is also demonstrated by regression analysis that Canadian overseas exports of whiskey, wheat flour, tobacco, hemlock, plywood, newsprint, sheet and strip steel, copper, nickel, and passenger automobiles are highly sensitive to changes in transport costs.

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INTRODUCTION

Transportation and its relation to the structure of trade has received comparatively little attention in economic analysis. The present body of theory has largely by-passed the influence of transport costs. This is true of empirical research as well.

The intention of this dissertation was to remedy one of these deficiencies by presenting an empirical study on transport costs and the structure of trade in Canadian exports. This proved too ambitious an undertaking. The research had to be restricted to ocean transportation, particularly to that performed by general-cargo-liners. This means that Canada's trade with the United States has been excluded from the analysis. The reason for this limitation is above all the considerable complications that would be introduced, if land transport costs were included.[1] For example, the Canadian production location(s) and the foreign consumption location(s) would have to be determined. This would require detailed information on means of transport and on land transport costs. Such information is currently not available.

The restriction of ocean transportation to liner shipping implies that the transportation and exports of commodities such as grains and ores were not considered in the study. These products are usually transported by tramps. The inclusion of tramp shipping

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[1]For an account of the intricate transport features that exist between the United States and Canada, see J.M. Munro, Trade Liberalization and Transportation in International Trade (Toronto: PPAC and the University of Toronto Press, 1969).

would have made the research project unmanageably large.

Another limitation of the analysis is its static nature. A change in transport costs may lead to a change in location, and therefore to a change in trade. This area deserves attention, but it was considered to be beyond the scope of the project.

The dissertation is presented as a series of essays. The first essay is a critical survey of the existing attempts at integrating transport costs and trade theory. It also serves an an illustration of some of the difficulties encountered when space is introduced in economic analysis.

As much of world trade in manufactures and semi-manufactures is carried by cargo-liners belonging to shipping conferences (cartels), it was decided that their practices and probable effects on trade deserved investigation. This analysis is presented in the second essay, which also contains information on conferences operating from Canadian ports. It is also a useful introduction to the third essay, in which a detailed examination of one aspect of conference behaviour is presented: freight rate determination. Freight rates on most Canadian export routes are analysed by multiple regression. These freight rates are used in the final essay, where the effect of liner freight rates on a number of Canadian overseas exports is statistically determined. This essay is followed by a conclusion, where an integration of the results from the third and the fourth essays is attempted.

CHAPTER 1

A SURVEY OF TRANSPORT COSTS AND INTERNATIONAL TRADE THEORY

All but a few studies in modern international trade theory have neglected the influence of transport costs.[1] Lefeber has pointed out that this is more remarkable in view of the emphasis on comparative advantage, a concept which cannot be correctly interpreted without taking transport costs into account.[2] The abstraction from transport costs is not necessarily a denial of their importance but a consequence of the post-war preoocupation with the logical implications of the factor proportions model. As is well known, the proofs of the Heckscher-Ohlin theorem and its corollary, the factor price equalization theorem, require the assumption of zero transport costs. It is also probable that the neglect of transport costs in trade theory is closely related to the neglect of monopolistic competition, since the existence of transport costs in the world market excludes the possibility of perfect competition.

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[1] Neglect of transport costs is common in other branches of economics as well. Until quite recently, general equilibrium theory paid no attention to space. Hicks, Mosak, Samuelson, and Debreu all treat an economy in which factors, producers, commodities, and consumers are congregated at one point.

For an exposition of modern general equilibrium theory, see for example James Quirk and Rubin Saposnick, Introduction to General Equilibrium Theory and Welfare Economics (New York: McGraw-Hill Book Company, 1968).

[2] Louis Lefeber, Allocation in Space, Production, Transport and Industrial Location (Amsterdam: North Holland Publishing Company, 1956), p. 1.

The survey presented below is divided into five parts, followed by a conclusion: (1) the pre-Ohlin theory, (2) Ohlin's contribution in his book International and Interregional Trade, (3) the Heckscher-Ohlin-Samuelson theory of trade, (4) new theories of trade, and (5) mathematical models of trade.

The Pre-Ohlin Theory

Chipman, in reviewing the early developments of the theory of comparative advantage, maintains that the classical writers generally assume that transport costs are zero.[1] Although this is true, it does not imply that they ignored the effect of transport costs on trade. Ricardo, for example, recognized that regardless of comparative advantage, some commodities would never be exported because of their bulky nature.

> Suppose all nations to produce corn, cattle, and coarse clothing only, and that it was by the exportation of such commodities that gold could be obtained... gold, would naturally be of greater exchangeable value in Poland than in England, on account of the greater expense of sending such a bulky commodity as corn the more distant voyage, and also the greater expense attending the conveying of gold to Poland.... If, however, Poland should be the first to improve her manufactures, if she should succeed in making a commodity which was generally desirable, including great value and little bulk...she would obtain an additional quantity of gold in exchange for this commodity, which would operate on the price of her corn, cattle and coarse clothing. The disadvantage of distance would probably be more than compensated by the advantage of having an exportable commodity of great value, and money would be permanently of lower value in Poland than England.[2]

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[1] J.S. Chipman, "A Survey of International Trade Theory: The Classical Theory," Econometrica, 33 (July, 1965), pp. 477-519.

[2] David Ricardo, The Principles of Political Economy and Taxation, with an introduction by Michael P. Fogarty (London: J.M. Dent & Sons Ltd., 1957), p. 89.

Thus Ricardo maintained that a country can compensate for an unfavourable location by developing exportable commodities that can overcome the high transport costs involved, i.e. commodities with high value and low bulk.

Mill, in discussing the final exchange ratio between the United States and England after trade, introduced the question of who will bear the burden of the transport costs.

> When cost of carriage is added, it will increase the price of corn to England and of iron to the United States. But as everyone knows, an increase of price affects the demand; and as the demand on each side is affected, a new ratio of exchange will finally be reached consistent with the strength of desires on each side. Who therefore will pay the most of the cost of carriage, England or the United States? That will again depend on whether England has the greatest relative demand for American goods as compared with the demand of the United States for English goods.[1]

Like Ricardo, Mill also elaborated on what commodities will be involved in international trade.

> Cost of carriage has one effect more. But for it every commodity would (if trade be supposed free), be either regularly imported or regularly exported. A country would make nothing for itself which it did not also make for other countries. But in consequence of cost of carriage, there are many things, especially bulky articles which every or almost every country produces within itself. After exporting the things in which it can employ itself most advantageously, and importing those in which it is under the greatest disadvantage, there are many lying between, of which the relative cost of production in that and in other countries differs so little that the cost of carriage would absorb more than the whole saving in cost of production which would be obtained by importing one and exporting the other.[2]

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[1] John Stuart Mill, Principles of Political Economy, abridged by J. Lawrence Laughlin, Ph.D. (New York: D. Appleton and Company, 1891), p. 395.

[2] Ibid.

It is only in his essays that Mill explicitly assumed that the cost of carriage is nil.[1]

Marshall can be accused of being the first major economist to completely ignore the existence of transport costs. Their influence is by-passed by the assumption that the processes of production are not completed until the commodities are delivered to the importing country.[2] The reason for this neglect can be found in his Principles. When Marshall discussed market equilibrium or "the theory of the mutual relations of demand and supply," he asserted that

> The difficulties of the problem depend chiefly on variations in the area of space, and the period of time over which the market in question extends; the influence of time being more fundamental than that of space.[3]

Graham initially assumed equal costsof transport to the domestic and foreign markets.[4] This, he advocated, was a major improvement on the usual assumption of zero transport costs. Later he relaxed this assumption and noted that in the presence of transport

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[1]J.S. Mill, Essays on Some Unsettled Questions of Political Economy, no. 7 in a series of reprints of scarce works on Political Economy (London: Lund Humphries, 1948).

[2]Alfred Marshall, The Pure Theory of Foreign Trade, No. 1 in a series of reprints on scarce tracts in Economics and Political Science, (London: Lund Humphries, 1935), p. 2.

[3]Alfred Marshall, Principles of Economics, 8th edition (London: Macmillan & Co. Ltd., 1964), p. 411.

[4]Frank D. Graham, The Theory of International Values (Princeton: Princeton University Press, 1948), pp. 139-146.
Graham published his work after Ohlin, but his contribution is most conveniently reviewed among the pre-Ohlin theories.

costs, any two countries can produce an indefinite number of common products. To illustrate how transport costs affect the structure of trade, he made use of a transport cost hyperbola - a concept borrowed from Fetter.[1] Let it be assumed that there are two countries and two centres of production, one in each country. The cost of production in one country is higher than that in the other country. Then, according to Graham, a hyperbola can be drawn which intersects the area between the two production points. At any point on the hyperbola, the difference in transport costs between the two production centres is exactly equal to the difference in the costs of production.[2] Inside the hyperbola, the market is served by the higher cost centre, outside by the lower. If there are several centres of production, each centre would serve a market area denoted by an uncut portion of the hyperbola. Where several hyperbolas intersect, the market will be served by the centre with the lowest delivered price.

Graham attacked Mill on his contention that the division of transport costs depends on the relative elasticities of demand, and maintained that the cost will always be borne by the importer.[3] At the international exchange ratio, the producer will be indifferent between producing the export commodity and other commodities. The

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[1]Frank A. Fetter, "The Economic Law of Market Areas," Quarterly Journal of Economics, XXXVIII (May, 1924), pp. 520-529.

[2]Graham recognized that the hyperbola would not be geographically accurate as transport costs are not strictly proportional to distance.

[3]Graham, p. 145.

importer, on the other hand, will not be indifferent, for if the cost difference between the product of the home country and the import good was insufficiently large to cover transport costs, the producers in the home country would manufacture the product themselves. For this reason, the importers are willing to bear the whole cost. The gains from trade for the importing country are consequently reduced by the cost of transport.

Graham arrived at this conclusion by using a theoretical framework which allows only for limiting price ratios. It is open to question, however, whether or not he correctly interpreted Mill. It seems that Mill was discussing the burden of transport costs, while Graham was concerned with who pays for transportation, which are two completely different issues. The degree to which transport costs are passed on to the importer depends on the relative supply and demand elasticities. The burden will be heavier for the importing country, the smaller its demand and supply elasticities for the traded product, and the larger the elasticities of the exporting country.

Other early economists writing on transportation and trade include Wicksell, Cunyngham, Barone, and Viner.[1] Wicksell was not interested in transport costs as a determinant of the structure of trade. He instead elevated transport costs to a factor of major

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[1]Knut Wicksell, "International Freights and Prices," Quarterly Journal of Economics, XXXII (Feb., 1918), pp. 404-410; for Cunyngham and Barone's contributions, see Murray C. Kemp, The Pure Theory of International Trade (Englewood Cliffs, N.J.: Prentice Hall, Inc., 1964), pp. 144-146; Jacob Viner, Studies in the Theory of International Trade (New York: Harper & Brothers Publishers, 1937), pp. 467-470.

importance in explaining the occurrence of differences in price levels between countries after a capital transfer has taken place. Cunyngham and Barone, on the other hand, showed by a very simple construction that if two countries both produce one commodity, there will be no trade between them, unless the difference between their home market prices is greater than the unit cost of transporting the commodity between the countries.[1] Their analyses suffer from the usual limitations of partial equilibrium analysis. In addition, they neglected the fact that payments have to be balanced. They also assumed that transport costs are constant, and their diagrams presuppose that it is known in advance which country is the exporter and which is the importer.

Viner was able to prove that if transport costs are introduced in a two country world (and are paid by the exporter), the equilibrium terms of trade will be less favourable for both countries, and the quantity traded will be smaller than would be the case if transport costs were not present. Viner's analysis is an improvement on Cunyngham and Barone's in that payments are balanced. However, it is still deficient for two reasons. In the first place, as in Cunyngham and Barone's analyses, it is assumed that there is prior knowledge of

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[1]The construction, which involves drawing ordinary Marshallian supply and demand schedules for both countries in the first and the second quadrants (the ones in the second quadrant being turned back to front), has also been used by C.P. Kindleberger, International Economics, 4th edition (Homewood, Ill.: Richard D. Irwin, Inc., 1968), p. 91.

which country exports which commodity.[1] Secondly, it is assumed that transport costs are constant and known in advance.

Ohlin's Contribution in "Interregional and International Trade"

A clear distinction should be drawn between what has become known as the Heckscher-Ohlin theory of trade, and the theory presented in Ohlin's book Interregional and International Trade.[2] Here, transport costs are far from ignored. A discussion of their influence on trade forms an integral part of the work. When reading Ohlin, one is surprised that such a realistic and lucid book resulted in such a formal and sterile theory.

Ohlin contends that

> international trade theory cannot be understood except in relation to and as part of the general location theory to which the lack of mobility of goods and factors has equal relevance.[3]

A distinction is made in the book between home market goods and interregional goods. This distinction had already been made by Ricardo.[4] Home market goods are such goods as personal services and commodities with very high transfer costs. Transfer costs are transport costs,

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[1]The assumption that it is known before the introduction of transport costs, which country has a comparative advantage in which commodity, avoids one important aspect of the problem, namely, the effect of the transportation industry on the demand for the factors of production, that is on the costs of production of all commodities and therefore on all demand and supply curves.

[2]Bertil Ohlin, Interregional and International Trade (Cambridge, Mass.: Harvard University Press, 1933). Revised edition, 1967. Page numbers refer to revised edition.

[3]Ibid., p. 97.

[4]Ricardo, p. 87.

custom duties, etc., of which transport costs are assumed to be the most important. There is no evidence given to substantiate this contention.[1]

If transport costs are introduced into Ohlin's factor proportions model, the total demand for a factor of production is not only derived from the demand for the products, but also from the demand for transport activities. Cost of transport is governed by the prices and quantities of the factors required. Thus the relation between cost of production at home, the foreign supply price, and the cost of transport will determine whether a given commodity will be imported, exported, or produced for the home market. The influence of these factors on exports and imports will also decide what transport services each region will supply.

Ohlin used an example to illustrate the effect of transport costs on the structure of trade.[2] Assume that there are three regions: A, B, and C. A and B are close together, while C is further away. A has concentrated on manufactures, while B and C are agricultural countries. A will export manufactures, B and C will export agricultural products. However, because of C's relative remoteness, she will not export the same products as B, who will mainly sell heavy, bulky, and

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[1]Ohlin also recognized that the level of transfer costs is affected by the volume of trade. Trade relations become more intimate and transportation becomes cheaper between regions that trade regularly and in large quantities. For discussion and empirical evidence on possible correlation between freight rates and the volume of trade, see chapter 3, below.

[2]Ohlin, p. 107.

easily spoiled commodities. Therefore, even though B and C have almost identical productive factors, they will not export the same goods.

Transport costs, according to Ohlin, play a dual role in determining international trade flows. On the one hand, they determine if and to which countries a commodity will be exported, and on the other hand, they determine where a commodity will be produced. Ohlin's version of location theory leans heavily on the Weberian theory, with its particular emphasis on transport costs.[1] Location is governed by the distance to raw material deposits and to the market; by access to transport facilities; and by the productive processes, i.e. whether or not the production of a commodity is weight-losing, weight-gaining, or footloose. Places with suitable transport facilities attract labour and capital and become important markets. The industries that are attracted are market-oriented; they are likely to benefit from economies of scale, and they are also likely to produce goods which are difficult to transport. On the other hand, places with poor transport facilities tend to attract small industries producing easily transportable goods.

Import duties also affect location and trade by increasing the impediments to the transfer of goods in various stages of production. Insofar as tariffs are higher on finished goods, they make semi-manufactured goods more mobile, and distribute the various stages of production between countries. Ohlin also recognized that transfer

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[1]Alfred Weber, Über den Standort der Industries (Tübingen, 1909). English translation with introduction and notes by C.J. Friedrich, Alfred Weber's Theory of Location and Industries (Chicago: The University of Chicago Press, 1929).

costs are of relatively little importance to many goods that are easily transportable and duty free. However, transfer costs of other goods affect factor supply and factor prices in various places, and hence the trade of all goods and the location of all industries.

It would have been more logical if Ohlin had first developed a general location theory, and then developed his international and interregional trade theory as a special case. Instead, he starts by presenting a simplified theory of international trade. Then, successively, costs of transfer, factor movements, and local differences in labour and capital supply are introduced. The attempt at a general location theory suffers from several deficiencies.[1] Ohlin switches apparently quite arbitrarily from general equilibrium analysis to the Weberian partial equilibrium analysis. The treatment of locational factors is sketchy and, in general, does not attain the same intellectual clarity as the treatment of the factor proportions model.

Lösch accused Ohlin of not having gone far enough into location theory.[2] His objection is that classical and neo-classical writers, including Ohlin, treat each country as a point in space instead of as a part of a large number of interlocking areas. A single price level in each country would be untenable, unless the world were built up by a large number of separate islands. Price movements take the

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[1]Walter Isard, Location and Space Economy (New York: MIT Press and John Wiley and Sons Inc., 1956), pp. 50-53.

[2]August Lösch, "A New Theory of International Trade" in International Economic Papers, no. 6 (London: Macmillan, 1956), pp. 50-56.

form of waves that emanate from the point where a payment has been made or has been received. If a payment is received, there will be an upward pressure on prices, which will transmit itself in waves that will gradually become larger and weaker as the distance from the centre increases. The point from where the payment was made will be the centre of similar circles, which will in this case represent price decreases. At one point, circles from the two centres will meet. According to Lösch, there is nothing to suggest that this point will be situated on the national border.

Lösch claimed that he had presented a new theory of international trade. Goods will be imported if the production centre lies beyond the national border, and the consumption centre within the national border. However, this statement of Lösch's hardly constitutes a theory of international trade. It is a truism, which does not explain the more important question of what determines international specialization in production and exports.

The Heckscher-Ohlin-Samuelson Theory of Trade

The formal Heckscher-Ohlin theory, as developed by Samuelson, pays virtually no attention to the influence of transport costs on the structure of trade.[1] However, transport costs have been discussed in dealing with certain aspects of trade theory. Samuelson, for example,

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[1]See for example R.E. Caves, Trade and Economic Structure (Cambridge, Mass.: Harvard University Press, 1960); J. Bhagwati, "The Pure Theory of International Trade" in AEA and RES, Surveys of Economic Theory, Volume II (London: Macmillan & Co., Ltd., 1965), pp. 156-240; J.S. Chipman, "A Survey of the Theory of International Trade: The Modern Theory," Econometrica, 34 (Jan., 1966), pp. 18-76.

in an article on the transfer problem, argued that the classical writers must have assumed the presence of transport costs to have come to the conclusion that the terms of trade must turn against the transferring country.[1] To avoid the complication of having to introduce a third industry, it is assumed that transport costs are met by the wastage of a proportion of the goods traded. This simplification was also used by Mundell.[2] Mundell showed that if the assumption of factor immobility between countries is relaxed, and impediments to trade are introduced (tariffs or transport costs), both factor and commodity price equalization will occur.[3] Mundell has also shown how transport costs can be integrated geometrically in offer curve diagrams, which can then be used to analyse the transfer problem, optimum tariffs, and the issue of real factor returns.[4] Again, like the analyses of Cunyngham, Barone, and Viner, the treatment is not very enlightening, as it is assumed beforehand which country exports which commodity.

Herberg has thoroughly explored the implications for the factor

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[1]P.A. Samuelson, "The Transfer Problem and Transport Costs" in American Economic Association, Readings in International Economics, edited by R.A. Caves and H.G. Johnson (Homewood, Ill.: Richard D. Irwin Inc., 1968) pp. 115-148.

[2]Robert A. Mundell, International Economics (New York: The Macmillan Co., 1968), pp. 65-84.

[3]Ibid., pp. 85-99.

[4]Ibid., pp. 65-84. The effect of transport costs on real factor returns had already been discussed by J.E. Meade in Trade and Welfare (London: Oxford University Press, 1955), pp. 362-377.

proportions model of the Samuelson-Mundell assumption that transport costs are met by a wastage of production.[1] He carefully delineates the necessary and sufficient conditions for autarchy and world market equilibrium, in terms of the necessary price differences between the two countries for trade to occur. It is demonstrated how offer curves can be used to handle the case of varying transport costs. An alternative graphic technique is also presented to illustrate transport costs in the two factor-two commodity-two country version of the factor proportions model. However, Herberg does not integrate the effect of the transport industry on resource prices and therefore on production costs.

New Theories of Trade

Leontief's familiar attempts to test the factor proportions model gave rise to numerous discussions and articles on the rationale and assumptions of the model.[2] Several new theories of trade emerged, which have so far not been integrated. Hufbauer distinguishes between six recent theories that emphasize in turn (1) human skills, (2) scale economies, (3) stages of production, (4) technological gap, (5) the

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[1]Horst Herberg, "Zur Möglichkeiten der Einbeziehung von Trans-port-Kosten in die reine Theorie des Internationalen Handels," Jahrbücher für Nationalökonomie und Statistik, 181 (June, 1968), pp. 549-561.

[2]Wassily Leontief, "Domestic Production and Foreign Trade, the American Capital Position Re-examined," AEA, Readings in International Economics, pp. 503-567. For a summary of the subsequent discussion, see Chipman, "A Survey of the Theory of International Trade: the Modern Theory," pp. 44-57.

product cycle, and (6) preference similarity.[1] He also shows that all these theories, including the factor proportions theory, perform reasonably well under testing on the same data. The human skills theory, which is basically a modified version of the factor proportions theory, gave slightly superior results.

Of the recent theories, only the product cycle theory pays attention to the influence of space.[2] The theory postulates three product stages: (1) the new product stage, (2) the maturing product stage, and (3) the standardized product stage. For a new product to develop, good communications between buyers and sellers are important. The most likely place for a labour-saving, high income oriented product to originate is the United States. The initial production process relies heavily on skilled labour. After a time the product will be demanded in other high income countries as well. As demand expands, standardization takes place and production becomes cost-oriented. The existing plants might be relocated abroad, especially if considerable labour cost savings would be involved. If labour costs are sufficiently low to compensate for the increase in transport costs, re-exports back to the United States may take place. As standardization proceeds, location

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[1] G.C. Hufbauer, "The Impact of National Characteristics and Technology on the Commodity Composition of Trade in Manufactured Goods" in _The Technology Factor in International Trade_, edited by Raymond Vernon (New York: NBER and Columbia University Press, 1970), pp. 145-231.

[2] See Raymond Vernon, "International Investment and International Trade in the Product Cycle," _Quarterly Journal of Economics_, LXXX (May, 1966), pp. 190-207.

may even shift to the developing countries. The theory has been successfully tested by Douglas, Hufbauer, and Hirsch among others.[1]

Mathematical and Other Models of Trade

One of the reasons why transport costs have been by-passed in most trade theories is the complicating feature introduced by the element of jointness and the increased number of variables. This makes the analysis almost impossible if there is heavy reliance on geometric techniques. After mathematical programming was invented the problem became somewhat easier.

Yntema presented one of the earliest mathematical attempts to include transport costs in trade theory.[2] His model is a simultaneous equation model with demand and supply equations for m countries and n commodities. The initial assumptions are fairly restrictive: no invisible items, no barriers to trade, prices are equal after trade, demand and supply schedules for each commodity are given, and the price-specie-flow mechanism is in operation. Subsequently, several assumptions are relaxed, among these the assumption of zero transport costs. Yntema

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[1] G.K. Douglass, Innovation and International Trade, a paper prepared for the annual conference of the Western Economic Association, San Diego, California, August 1965; G.C. Hufbauer, Synthetic Materials and the Theory of International Trade (Cambridge, Mass.: Harvard University Press, 1966); and Seev Hirsch, Location of Industry and International Competitiveness (Oxford: Clarendon Press, 1967). See also the Technology Factor in International Trade.

[2] Theodore Otte Yntema, A Mathematical Reformulation of the General Theory of International Trade (Chicago: The University of Chicago Press, 1932).

was not able to integrate transport costs in a perfectly general fashion. The joint demand aspect of transportation is included, but it is assumed in advance which commodities are imported and exported into each country.

More successful models were developed by Isard and Peck, and Isard and Ostroff.[1] Isard and Peck, borrowing from Graham's theory, demonstrated how transport costs and location theory can be combined into an analysis to determine the pattern of trade if opportunity costs are introduced. Assume three countries, A, B, and C, each possessing twelve productive units. After trade, two finished goods, steel and textiles, are consumed by each. Ore can be found in A and coal in B. One weight unit of steel requires two weight units of ore and four weight units of coal, and in addition shipping for the finished steel and for the raw materials. Each country can produce eight units of steel. Shipping requirements on textiles are assumed to be negligible. There is perfect competition and costs are constant. Each country is one hundred distance units from the other two.

Table 1 shows for each country the opportunity cost in the use of a productive unit for the production of any commodity. X_A, X_B, and X_C correspond to the amounts of steel which have to be given up in each country for the purchase of coal, ore, and shipping, if the country is to produce and deliver steel.

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[1] Walter Isard and Merton Peck, "Location Theory and International and Interregional Trade," Quarterly Journal of Economics, 68 (Feb., 1954), pp. 97-114; Walter Isard and David J. Ostroff, "General Interregional Equilibrium," Journal of Regional Science, 2 (Spring, 1960), pp. 67-74.

TABLE 1

AMOUNT OF EACH COMMODITY A PRODUCTIVE UNIT IN COUNTRIES A,B, AND C CAN PRODUCE WHEN DEVOTED TO THE PRODUCTION OF ONE COMMODITY ALONE

Commodity	Country		
	A	B	C
Ore	30	0	0
Coal	0	20	0
Textiles	5	4	2
Shipping (in distance units)	2400	600	600
Steel	$8-X_A$	$8-X_B$	$8-X_C$

Source: Isard and Peck, p. 107.

The minimum transport cost point can be calculated according to Table 2. As the f.o.b. prices of ore and coal are identical wherever the steel is produced, and as B has less shipping expenses than either A or C, it follows that $8-X_B > 8-X_A > 8-X_c$. However, in order to derive the values of the X's and the pattern of production and trade, demand must be introduced. It is assumed that each country desires to consume twice as large a quantity of textiles as of steel. A linear programming solution would reveal that textiles would be produced in all countries. The exchange values would be: one unit of textiles for six of ore, for 500 of shipping, for five of coal, and for $\frac{8-X_B}{4}$ or $\frac{8-X_c}{2}$ of steel. A will then produce all the ore and shipping, B all the coal and steel, and C only textiles. Isard and Peck then demonstrated that by changing the distance variable, the pattern of trade changes. This model was subsequently generalized by Isard and Ostroff.[1]

Isard and Ostroff's model is a linear programming model, adapted from the Walrasian model of general equilibrium. It is different from the Walrasian model in that, like Debreu's, it does not distinguish between factors and goods.[2] There is a fictitious world trader, who serves the same function as the auctioneer in general equilibrium theory, but the world trader adjusts quantities instead of prices, since the prices are given in all the individual markets. The producers are profit maximizers, the consumers utility maximizers, and the world trader maximizes a gains-from-trade function. The usual equili-

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[1]Isard and Ostroff, "General Interregional Equilibrium."

[2]See Kelvin Lancaster, Mathematical Economics (New York: The Macmillan Company, 1968), pp. 145-156.

TABLE 2

DISTANCE INPUT REQUIREMENTS PER WEIGHT UNIT OF STEEL

Country to which delivered		On coal	On ore	On steel	Total
A	if production at A	400	0	0	400
A	if production at B	0	200	100	300
	if production at C	400	200	100	700
	if production at A	400	0	100	500
B	if production at B	0	200	0	200
	if production at C	400	200	100	700
	if production at A	400	0	100	500
C	if production at B	0	200	100	300
	if production at C	400	200	0	600

Source: Isard and Peck, p. 107.

brium conditions are achieved: the ratio of factor prices equals the ratio of marginal products, the ratio of marginal utilities equals the ratio of commodity prices. When the gains-from-trade function is at a maximum, which is zero, the difference between the price of commodity i in region U, and the price of commodity i in region L, plus the cost of transport (between the two regions) is at a maximum, which is also zero.[1] If the value of the gains-from-trade function is positive, no equilibrium is possible. If it is negative, it implies that the difference between commodity prices in the two regions does not cover the cost of transport. Therefore no trade will take place. They also proved that in equilibrium the supply of commodities must equal the demand for commodities. Further, if for any region exports and imports are not equal in value, an asset transfer must take place.[2]

The Isard and Ostroff model does not allow for different locational alternatives like the simple model presented by Isard and Peck, as the number of producers are fixed in each region.

As for short-run analysis, Isard suggested the development of income potentials, which would be used to indicate the influence of the distance variable.[3]

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[1]When the functions are not at a maximum, they are negative.

[2]For a general discussion of the existence of equilibrium, see for example, Lancaster, Mathematical Economics, pp. 146-149.

[3]Walter Isard, "Location Theory and Trade Theory, Short-Run Analysis," Quarterly Journal of Economics, 68 (May, 1954), pp. 305-320.

$$iV = \sum_j iV_j = \sum k \frac{Y_j}{d_{ij}^a}$$

iV = income potential produced by all nations upon nation i
iV_j = income potential produced by nation j upon nation i
k = a gravitational constant
d_{ij} = average effective distance between nations i and j
Y_j = income of nation j
a = constant power to which d_{ij} is raised

Thus, the income potential produced by j on i varies inversely with the distance. A relative income potential is also introduced:

$$\frac{iV_{t+1}}{(1+c)iV_t}$$

where iV_{t+1} and iV_t represent the total income potential produced by all nations on nation i in two successive time periods. C is the percentage change in world income between t and t+1. When incomes in all nations of the world rise by the same proportion, the relative income potential is one. When incomes in the more distant nations rise proportionately more, the relative income potential is less than unity and the nation's position has deteriorated. If it is greater than unity, i.e. if the incomes of neighbouring nations increase more than proportionately, the nation's position will have improved. However, this would clearly depend on their income elasticity of demand for country i's products, which rather limits the usefulness of the concept.

Isard also advocated the application of input-output analysis. In this case, the matrix of technical coefficients would indicate the output of an industry in another nation, necessary to furnish one

dollar's worth of output in an industry in the given nation. The distance variable could be incorporated in the coefficients, as they more or less represent a disaggregated marginal propensity to import. This marginal propensity to import would fall with increasing distance.[1]

Kemp has set up the transport cost problem as one in non-linear programming, involving maximization of a Bergsonian welfare function subject to certain supply relationships.[2] The analysis is limited to two countries, but can quite easily be extended to include several countries. Country i produces X_i cubic yards of commodity i. It also produces transportation service: C_i cubic yards of round trip space. c_{ij} is the consumption of the ith commodity by the jth country. a_i is a weight. Each utility function is strictly concave.

Maximize: $a_1 W^1(c_{11}, c_{21}) + a_2 W^2(c_{12}, c_{22})$

Subject to:

$$X_i - \sum_j c_{ij} \geqslant 0 \qquad (1)$$

$$\Sigma C_i - c_{12} \geqslant 0 \qquad (2)$$

$$\Sigma C_i - c_{21} \geqslant 0 \qquad\qquad i=1,2$$

$$f_i(X_i) - C_i \geqslant 0 \qquad (3)$$

$$c_{ij}, X_i, C_i \geqslant 0$$

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[1]Since Isard's article in 1954, there have been many applications of input-output analysis to international trade. For some see Grant Taplin, "Models of World Trade," Staff Papers, XIV (Nov., 1967), pp. 433-455. For a Canadian-United States application, see Ronald J. Wonnacott, Canadian and American Interdependence, An Interindustry Analysis of Production and Prices (Amsterdam: North Holland Publishing Co., 1961)

[2]Kemp, The Pure Theory of International Trade, pp. 147-153.

Constraint (1) states that consumption may not exceed production, constraint (2) that both countries must supply sufficient transportation for trade in both directions, and constraint (3) is a manipulation of a general production function: $C_i \leqq f_i(X_i)$. This is more appropriately called a transformation function, since it states that for given production of one commodity, there is an upper limit to the transport services that can be provided. Constant returns to scale are assumed which imposes the concavity condition on equation (3).

As the problem involves non-linear programming, the Kuhn-Tucker conditions for a saddle point (a maximum) prove to be useful.[1] Apart from the usual conclusions about non-negative prices, the Kuhn-Tucker conditions give the following results: If the supply of carriage in one direction exceeds the demand, the assigned prices will be zero. This means that except for the case where the volume of traffic is equal in both directions, carriage in one direction will be free. Further, the price of roundtrip carriage must be at least as great as the sum of the two prices of one way carriage.[2] A zero shadow price, when trade is not balanced, is clearly not desirable, but is inevitable in this kind of programming model.

Neither Isard nor Kemp paid any attention to the routing question, which is certainly an integral part of the transportation

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[1]Lancaster, Mathematical Economics, pp. 65-75.

[2]Two additional results are that the value of the marginal product of a resource must be the same in each occupation, and that the marginal rate of substitution along the welfare contours must be equal to the local price ratios.

problem.[1] Chipman, for example, maintains that even if the movement of empty ships is empirically negligible, it should nevertheless be accounted for, since this might easily be the result of the influence of differential transport costs on the location of industry.[2] In view of this, a satisfactory model must not only integrate transportation but also location theory.

A general equilibrium analysis of production, transport, and industrial location has been presented by Lefeber.[3] His analysis is again built on a Walrasian general equilibrium model. Two methods of solution are used: the Lagrangean method and the linear programming method. In contrast to Isard and Ostroff, Lefeber introduced factors and factor mobility. An objective function (or alternatively a specified welfare function), containing the value of all products in all markets, is maximized subject to three conditions: (1) the demand for transportation must be less than or equal to the supply of transportation, (2) the demand for factors must be less than or equal to the supply of factors, (3) the demand for products in all locations

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[1]The routing problem was solved earlier by T.C. Koopmans, in "Optimum Utilization of the Transportation System," Econometrica (supplement), 17 (July, 1949), pp. 136-146. See also T.C. Koopmans and Stanley Reiter, "A Model of Transportation" in Activity Analysis of Production and Allocation, edited by T.C. Koopmans (New York: John Wiley and Sons, 1952), pp. 147-158.

[2]Chipman, "The Classical Theory," p. 512.

[3]Lefeber, Allocation in Space . . .

must not exceed the supply of products. The locations are fixed and infinitely divisible, each being endowed with different resources or productive factors. There are consumption locations and production locations which do not necessarily coincide. Perfect competition is assumed in all markets. All resources from any location can be utilized at any other location, i.e. no resource or factor has infinite transport costs. The production functions are homogeneous of degree one. This is to ensure convexity of the production surface, which is a necessary condition for a maximum, implying that increasing and decreasing returns to scale are ruled out.

For equilibrium, the following conditions must hold:

> If a good produced at one location is shipped to two different markets, the difference between the two market prices must exactly equal the difference between the marginal cost of transporting a unit of that good from the production location to the two markets.
> If a factor of production is employed in two industries locally and in transportation, its rent must be equal in all three occupations.
> If a good produced at two different locations is shipped to the same market, the difference between the good's shadow price at the two locations must exactly equal the difference between their respective marginal costs.
> If a factor is exported to another region, its rent in the new location must be equal to that earned by identical factors in the same region.
> Factors coming from a region which imports identical factors from abroad, must not be employed in the production of transportation services.[1]

Lefeber discussed the adaptations which would be necessary,to make his model useful for international trade theory. Consumer preferences could be introduced in a welfare function. Production

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[1]Lefeber, pp. 106-107.

functions were assumed to be identical for identical products in all regions, but Lefeber pointed out that this could easily be changed (the assumption is not necessary for the analysis). The main adjustment that would have to be made is allowance for immobility between countries of one or more factors of production. More complex systems that allow for factor mobility within countries could be constructed. Tariffs could perhaps be built into external transport costs and the relevant variable would be transfer costs. The model would also have to allow for asset transfer if the resulting balance of trade were not zero.

Conclusion

The early economists were fully aware of the importance of transport costs. It is likely, however, that they did not find it necessary to devote too much attention to their influence as they were more concerned with the normative aspects of trade than with the structure of trade. Marshall was the first major economist who completely ignored the existence of space, a bias that is still prevalent among Anglo-Saxon trade theorists. However, in all fairness, due credit should be given to the contributions of Graham, Viner, Meade, Mundell, Kemp and, above all, of Kindleberger, who in his introductory textbook, devotes a whole chapter to transport costs and location theory.[1]

As mentioned above, if transport costs are to be integrated into trade theory, location theory should be as well. What is needed

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[1]Kindleberger, International Economics, pp. 86-101.

is a general theory of location and trade, since location cannot be explained unless trade is also accounted for, and trade cannot be explained without the simultaneous determination of locations.[1] Lefeber's model is a significant contribution towards a satisfactory theory on the interregional level, but his analysis has been virtually ignored by trade theorists even though it can be adapted to international trade.[2] It is conceivable that the product-cycle theory and the factor proportions theory could be combined and formalized into a similar framework to Lefeber's, which would be desirable in view of the substantial empirical evidence on the product-cycle and the human skills version of the factor proportions theory. Different production functions denoting the first, second, and third stages of the product-cycle could be introduced in different countries, and allowance could be made for tastes in a welfare function. The resulting model would be very large and complex, and before it could be made operational, a large amount of empirical research on the determinants of location and trade would be necessary.

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[1]Isard, Location and Space Economy, p. 109.

[2]For example, no mention of Lefeber's book can be found in Chipman's nor any other surveys of trade theory.

CHAPTER 2

SHIPPING CONFERENCES AND THEIR IMPORTANCE IN INTERNATIONAL TRADE

Cargo liners that belong to shipping conferences transport a substantial part of world trade in manufactured and semi-manufactured goods. It is therefore important to examine their practices as cartels and, if possible, to determine their effect on world trade in these commodities.

The first part of the essay contains a description of what shipping conferences are, how they have evolved and their importance in present world trade. This is followed by a discussion of the advantages and disadvantages of the conference system, the need for its regulation, and existing legislation in various countries.

A substantial body of literature is now available on the conference system.[1] The main purpose of the essay presented below is to

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[1] The standard texts include Allen R. Ferguson, et al., The Economic Value of the United States Merchant Marine, (Evanston, Ill.: The Transportation Center at Northwestern Univerity, 1961); D.B. Marx, International Shipping Cartels (Princeton: Princeton University Press, 1953); William L. Grossman, Ocean Freight Rates (Cambridge, Mass.: Cornell Maritime Press, 1956); Esra Bennathan and A.A. Walters, The Economics of Ocean Freight Rates (New York: Fredrick A. Praeger Publishers, 1969).

Other less general works are S.G. Sturmey, British Shipping and World Competition (London: The Athlone Press, 1962); Kevin Burley, British Shipping and Australia, 1920-1939 (Cambridge: Cambridge University Press, 1968); United Nations, UNCTAD, T. Sarangan, Liner Shipping in India's Overseas Trade, TD/B/C.4/38.

serve as an introduction to Chapter 3, which contains an econometric analysis of liner freight rates on some of Canada's major export routes.

Introduction to the Conference System

A shipping conference is a cartel, the members of which are cargo lines serving the same route, for example, eastern Canada to the United Kingdom. A different shipping conference usually serves the return route, i.e. the United Kingdom to eastern Canada. The participating carriers all agree to charge the same freight rates and to adhere to a fixed sailing schedule. Pooling agreements and barriers to entry are common. Like railway rates, liner freight rates vary according to value, the nature of the commodity shipped, quantity shipped, and the various characteristics of the route of transport.

The shippers, if they so desire, are tied to the conferences by contracts, which usually stipulate that all their freight should be reserved for the conferences. As a reward, the shipper receives an immediate rebate in the form of a lower freight rate (the dual rate system), or a cash rebate at the end of the contract period (the deferred rebate system). When the contract is signed, the shipper is also guaranteed that no rate increases will take place within a certain time period (usually ninety days).

Evolution and Present Extent of Shipping Conferences in World Trade

The conference system emerged out of a chaotic situation on the world shipping markets during the late 19th century.[1] The reason

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[1] Marx, International Shipping Cartels, p. 45.

for this chaos was the advent of steamships.and the opening of the Suez Canal. Steamships had to compete with the faster and cheaper sailing ships. Technological innovations made large expansions in capacity possible. The Suez Canal greatly reduced the demand for transportation in terms of ton miles. The resulting excess capacity led to rate wars, and those shipping lines which survived began to organize themselves. The first successful conference in operation was the Calcutta Conference, formed in 1875.[1] The use of conferences spread rapidly and by the 1890s most of the major shipping routes of the world were cartelized.[2] At present, there are approximately 300 conferences in operation.[3]

All ocean trade is not covered by ocean liners. There are basically four types of ships on the high seas: (1) the tanker, which carries oil and some other liquid cargoes; (2) the bulk carrier, which mainly carries ore and grain; (3) the tramp, which carries various

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[1]Marx, <u>International Shipping Cartels</u>, p. 47.

[2]Arnljot Strømme Svendsen, "Liner Conferences and the Determination of Freight Rates" (Bergen: The Institute of Shipping Economics, 1957), mimeographed paper, p. 3.

The first conference involving Canadian trade was the North Atlantic Freight Conference, formed in 1902 (see Restrictive Trade Practices Commission, <u>Shipping Conferences, Arrangements and Practices</u> [Ottawa: Queen's Printers, 1965], p. 8). This conference drew its membership from carriers serving both eastern Canadian and United States Atlantic ports. Subsequently the Canadian Liner Committee was formed to deal with matters concerning the Canadian trade. The present Canadian-United Kingdom Eastbound Conference was not formed until 1935.

[3]<u>Shipping Conference Arrangements and Practices</u>, p. 7.

bulk cargoes; (4)the liner, which carries general cargo and passengers.[1] Table 3 gives a distribution of the typical tramp cargoes. Pure liner commodities are manufactured goods or partly processed materials, which are packed before shipment. Usually, the only alternative means of transport is air, which in most cases is not economically feasible. For example, according to the Canadian export statistics, the only commodities which are exported by air in any significant amounts are high valued food products, such as shell-fish, furs, jewellery, and precious metals, some types of industrial and office machinery, instruments, and pharmaceutical products.[2]

No carrier is completely committed to a certain type of cargo. The carrying of liquid cargoes, ores and grain can be combined into one ship, a so-called "OBO-ship" (OBO = ore/bulk/oil). As is apparent in Table 3, tramps occasionally load general cargo. Liners sometimes take bulk cargo when general cargo is scarce.

Only liners are organized in conferences, being the only ones that run on fixed routes and fixed schedules.[3] Tankers are usually owned by the manufacturers, while bulk carriers and ordinary tramps are most frequently chartered on a time or voyage basis at rates set in a competitive market.

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[1]Liners can be subdivided into three categories: (1) the passenger vessel, (2) the break-bulk cargo vessel, (3) the container vessel.

[2]Dominion Bureau of Statistics, Exports by Mode of Transport, 1969.

[3]Not all liners are conference members. A few have stayed out of the conference system and compete with the conferences as "independent carriers." Further, if the traffic on a certain route can only support one shipping line, there is obviously no need for a conference. An independent carrier which also has a monopoly on a certain route will be referred to as a "monopoly carrier."

TABLE 3

ESTIMATES OF CARGOES FOR WHICH TRAMP SHIPS WERE ENGAGED ON THE VOYAGE CHARTER MARKET, 1964-1967

Nature of cargo carried	Percentage of total (by weight)			
	1964	1965	1966	1967
Grain and seeds	54.23	60.08	58.45	53.45
Ores, ferrous/non-ferrous	12.88	10.03	11.14	11.29
Coals and coke	11.54	10.55	7.39	10.00
Metals/scrap	5.84	3.74	5.34	6.26
Fertilizer and salt	2.33	2.78	4.14	5.40
Phosphate rock	3.25	3.13	3.11	4.05
Sugar	4.00	4.16	4.09	3.61
Sulphur	1.65	1.78	2.20	2.76
Unspecified "general cargo"	0.84	1.20	1.50	0.94
Timber/wood products	1.77	0.99	1.16	0.94
Copra	0.58	0.78	0.77	0.66
Cement	0.84	0.42	0.50	0.46
Pyrite	0.18	0.15	0.11	0.15
Esparto	0.07	0.21	0.10	0.03

Source: The United Nations Conference on Trade and Development (UNCTAD), Level and structure of freight rates, conference practices and adequacy of shipping services, TD/B/C.4/38 Rev 1, p. 9.

Notes: The figures presented in the table underestimate total tramp loadings as all cargo carried on the time charter market is excluded.

It has been estimated that approximately 75 per cent of the volume of world trade is carried by sea.[1] Cargo liners transport 21 per cent and tankers, bulk carriers, and tramps 54 per cent.[2] As some liners are not members of conferences, the volume carried by conferences is somewhat less than 21 per cent. If the value of world trade were considered, it is likely that the percentage quoted for liners would be higher, as liners typically carry relatively high-valued manufactured and semi-manufactured goods compared to tramps and bulk carriers.

Recent Developments in Liner Shipping

The development in liner shipping have primarily moved towards the use of more efficient cargo-handling methods.[3] It has been estimated that the cost of cargo handling and discharging constitute 25-55 per cent of the operating costs of the average break-bulk cargo

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[1]Carleen O'Loughlin, The Economics of Sea Transport (Oxford: Pergamon Press Ltd., 1967), p. 4.

[2]G. Van den Berg, Containerization: A Modern Transport System (London: Hutchinson and Co. Ltd., 1969), p. 11.

[3]The present trend on the world shipping market is towards larger vessels. For example, the average size of tankers on order in 1969 was 150,000 dwt and 500,000 dwt tankers are already being planned. This trend can be attributed to substantial economies of scale. A tanker of 75,000 dwt costs approximately 110 US dollars per dwt to build, while the corresponding cost for a 250,000 dwt tanker is 80 dollars. Operating costs per dwt fall even more rapidly as the ship size increases. The trend is noticeable in the market for bulk carriers as well. A vessel of 105,000 dwt can ship iron ore from Peru to Japan for 3.75 US dollars per ton, while the cost for a Liberty ship of 10,000 dwt was approximately 16 US dollars per ton. (United Nations, UNCTAD, Review of Maritime Transport, 1969, TD/B/C.4/66, pp. 19-22).

liner.[1] Therefore considerable cost savings can be obtained by improving loading and discharging techniques. It has also been estimated that the conventional liner spends approximately 60 per cent of the year in port.[2] More efficient cargo-handling methods mean less time in port, which will increase revenue, as the ship will be better utilized in its cargo carrying capacity. There are basically three developments on this front: (1) palletization, (2) containerization, (3) the use of LASH-ships (LASH = lighter-aboard-ship).

Pallets have been in use for a considerable time, but as handling and packing devices they have now largely been overshadowed by containers. Palletization does not require any large investments, but compares unfavourably with containerization in that (1) pallets use more space than containers and cannot be integrated as easily with inland transport; (2) pallets do not permit a fully mechanized loading, stowage, or unloading; (3) their use requires more labour.[3]

LASH-ships are the latest developments in ocean transport.

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[1] Van den Berg, Containerization, p. 144.

[2] Ibid., p. 11.

[3] Ibid., pp. 29-31. The internationally agreed definition of a pallet is "a device on the deck of which a quantity of goods can be assembled to form a unit load for the purpose of transporting it, or of handling or stacking it with the assistance of mechanical appliances. This device is made up of two decks separated by bearers, or of a single deck supported by feet; its overall height is reduced to a minimum compatible with handling by forklift trucks and pallet trucks; it may or may not have a superstructure." (Van den Berg, p. 24).

The first came into service in October, 1969.[1] It is claimed that LASH-ships have an advantage over containerships in that the cargo is loaded on barges, which are carried on the vessel. This means that LASH-ships can serve most ports, as the barges have very small draught, and as the ports do not need any special equipment to handle them. It is also claimed that they could be useful in congested ports as the barges could be unloaded from the ship outside the port and, because of their small size, be taken to various uncongested areas of the port.

The development of containerized sea transport has been spectacular. The first containership was set into operation by McLean Sea Land Services at Bridgeport, Connecticut in 1957.[2] At the end of 1969 extensive containerization had been achieved between western Europe and the North American east coast, between the United States west coast and Japan, and between the United Kingdom and Australia. At that time, containerization was also proceeding on the routes covering general cargo transport between western Europe and Australia, between Japan and Australia, and between the North American pacific coast and western Europe.[3] Generally, rapid development of container services be-

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[1]UNCTAD, Review of Maritime Transport, p. 28. According to Time (March 15, 1971) another two are now in operation between the United States and the Mediterranean and an additional nine are under construction in the United States.

[2]Paul M. Danforth, Transportation (Garden City, New York: Doubleday and Company, Inc., 1970), p. 138.

[3]OECD. Maritime Transport, 1969 (Paris: OECD, 1970), pp. 77-81.

tween industrial regions, and the lack of it between industrialized and developing regions are notable features of the present scene.

The major advantages of containerized sea transport are: (1) by decreasing the time spent in port and by decreasing the costs of loading and discharging, containerized transport decreases some of the operating costs of the shipping line; (2) there is an apparent decline in the incidence of theft and damage to cargo; (3) containerization makes for faster transport by decreasing the time spent in loading and discharging, and by being easily integrated with the inland transport system. It is usually implied that all these advantages will lead to lower freight rates.

It should be kept in mind, however, that containerization is not feasible on all trade routes and for all cargoes. The traffic on the inbound and outbound legs of the route should be approximately equal, otherwise the problem arises what to do with the emptv containers. Ports with high stevedoring expenses and slow dispatch are obviously most suitable. As far as cargoes are concerned, commodities such as steel ingots, pig iron, and unmanufactured wood are not suited for containerization because of their size and weight.

The major disadvantage of containerized transport as opposed to the use of LASH-ships or pallets is the necessity of large investments in ports. The cost of a container berth is about ten times larger than that of a conventional berth.[1] There are also a number

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[1]United Nations. UNCTAD. Economics of Containerization. A Pilot Study Covering North Sea Services, TD/B/C.4/52, p. 20.

of problems that have not been resolved. Such problems are the adoption of uniform container standards, insurance, documentation of "door-to-door" transport, and labour unrest in response to technological change.

It has been speculated that further containerization could lead to the breakdown of the conference system.[1] As containerships do not have to suffer substantial delays in ports, they can do several voyages in the same time as a conventional cargo liner can do one. Unless there is a considerable exit from the conferences on certain routes, or unless there is a sudden upsurge in trade in manufactured or semi-manufactured products, excess capacity will occur. Excess capacity will encourage rate cutting, which will weaken the conferences. It is inferred that this will lead to their breakdown.

There is some evidence that price wars are already occurring on the North Atlantic route.[2] The apparent excess capacity, particularly on the westbound route, appears to be aggravated by the American legislation against barriers to entry, and by the United States government's insistence that military stores should only be carried by American flag ships.[3] This means that American liners have considerable spare capacity on the westbound route and are therefore more liable to accept westbound cargo at rates lower than conference rates.

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[1]Van den Berg, Containerization, p. 174.

[2]The Economist, Sept. 19, 1970.

[3]See below, p. 57.

Historically, however, price wars are not unusual in times of flux on the world shipping markets.[1] After a period of strife the conference agreement is usually reactivated. Apparently some scrapping of conventional liners is occurring, which is likely to alleviate the situation.[2]

Another development that is taking place is the integration of container-lines into so called "superconferences."[3] In 1969, an agreement was signed between leading container operators, covering liner trade between the United States east coast and Scandinavia, the United Kingdom, Continental Europe, and the Mediterranean countries.[4] It is not known when this proposed conference will become operational. It is possible that if it comes into effect, it will include conventional cargo liners as well, and will replace all the conferences at present serving the North Atlantic shipping routes.[5] A similar agreement has also been signed for the Europe-to-Australia trade.[6]

So there are two developments taking place simultaneously. On the one hand the occurrence of excess capacity puts considerable strain on existing conferences on some routes. On the other hand, there is in-

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[1]See for example Marx, International Shipping Cartels, pp. 147-148.

[2]The Economist, Nov. 21, 1970.

[3]UNCTAD, Review of Maritime Transport, p. 28.

[4]OECD, Maritime Transport, p. 16.

[5]Ibid., p. 17.

[6]Ibid.

creased co-operation between the conferences. The first development is likely to weaken the conferences, the second to strengthen them, as it diminishes the possibilities of interconference competition.[1]

The most likely outcome of these developments is that containerization will bring changes in conference structure because of the increased co-operation needed to ensure the rationalization and integration of services, and the most efficient use of resources. These changes will probably take the form of larger conferences, that is each conference will serve a larger area, and new forms of conference agreements. A new and different type of agreement is probably required to accommodate the problems involved with cargo that cannot be containerized and with the necessary integrations with the inland transport system.

Conferences Serving Canadian Export Cargo

There are fourteen conferences operating on Canadian outbound trade. Eight of these serve both Canadian and United States ports (joint conferences). The conferences serving only Canadian ports ("Canadian" conferences) and five of the joint conferences are listed in Table 4.[2] The table also gives information on the number of independent operators (non-conference liners) that serve the route and on the rebates offered to the shipper, if he signs a loyalty contract

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[1]This argument rests on the assumption that interconference competitions exist. If there is considerable overlap in membership between the various conferences, this assumption is perhaps unrealistic.

[2]The conferences that are excluded carry exports between the Pacific coast and the river Plate region in South America, between the Pacific coast and Indonesia, and between the acific coast and Malaysia.

TABLE 4

VARIOUS FEATURES OF SOME CONFERENCES SERVING CANADIAN PORTS, 1969

Name of Conference	Number of member lines	Percentage rebate	Number of independent operators
"Canadian" conferences			
Canada-United Kingdom Conference	9	20	5
Canadian Scandinavian and Baltic Eastbound Freight Conference	4	10	0
Canada-Continental Eastbound Freight Conference	11	15	9
Canada-Mediterranean Freight Conference	11	5	0
Eastern Canada-Australia New Zealand Freight Conference	4	17.5	1
Western Canada-Europe Conference	19	17.5	0
Joint United States=Canadian Conferences			
Pacific Coast -Australasian Tariff Bureau	9	15	1
Pacific-India/Pakistan/Ceylon/Burma Agreements	6	not applicable	0
America-West Africa Freight Conf.	14	15	0
Pacific Westbound Conference	24	15	0
Interamerican Freight Conference	14	not available	0
Latin America-Pacific Coast Steamship Conference	23	15	0
Latin America-Pacific Coast Steamship Conference to the Caribbean	23	15	0

Source: Data compiled from agreements filed with the Department of Industry, Trade and Commerce in Ottawa. The number of independent operators is estimated from Directory of Shipping Services from Canada to Foreign Ports, 1969 (Mimeographed publication, issued by the Department of Industry, Trade and Commerce)

Notes: The Pacific-India/Pakistan/Ceylon/Burma Agreement is not a conference in the normal sense, only a rate agreement. Each member issues and files individual tariffs. In practice, however, these are identical. (Personal correspondence with the Federal Maritime Commission.)

with the conference. As mentioned above, the benefits offered to the shipper for signing a contract, where he promises to reserve his cargo for conference liners, are either an immediate rebate (the dual-rate system) or a rebate at the end of the contract period (the deferred rebate system). Deferred rebates are not used by any of the listed conferences.

The variation in the size of the rebate for "Canadian" conferences is striking compared to the prevalence of the 15 per cent rebate offered by the joint conferences. The latter feature is probably caused by a clause in United States law, which makes a larger differential illegal.[1] The cause of the size of the difference among Canadian routes can only be speculated upon. A likely explanation is that the level of the rebate varies directly with the number of independent operators on the route. If the number of independent operators is large, the conferences, competing for cargo, would try to make contracts as effective as possible.

This hypothesis is not entirely consistent with the facts. More observations would obviously be required in order to employ a statistical test and therefore no definite conclusions can be drawn. The hypothesis works reasonably well for most conferences, the most notable exception being the Western Canada-Europe Conference. This conference faces no competition from independent operators but offers a relatively large rebate.

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[1]See below, p. 57.

There are two possible reasons for a large rebate on this route. In the first place, the port of Seattle is in direct competition with the port of Vancouver. Secondly, little general cargo moves between Vancouver and Europe compared to a substantial amount of tramp cargo.[1] This means that the conference could encounter substantial competition from tramps. As mentioned above, if there is spare capacity, tramps welcome general cargo. These two factors could induce the conference to offer a relatively large rebate to make certain that the shippers will use its services.

Until recently containerization of Canadian trade routes was relatively modest. Only one integrated service existed in 1969. This service was supplied by Dart Container Line and Manchester Liners Ltd. and included cargo between Montreal and Manchester, Southampton and between Montreal and Antwerp.[2] In 1970, Canadian Pacific opened a new container terminal at Quebec, serving Greenock and Liverpool, and Dart Container lines inaugurated a service from Halifax to New York, Southampton, Antwerp, Gothenburg, and Le Havre.[3] Vancouver also had its first container berth in the same year.[4] Another terminal was opened in St. John's with container services to Australia, in the spring of

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[1] Dominion Bureau of Statistics. Shipping Report, Part 1, 1967.

[2] The Financial Post, Nov. 7, 1970.

[3] Ibid.

[4] The Edmonton Journal, March 31, 1970.

1971.[1]

Therefore, it is not surprising that containerization had not had a significant impact on Canadian outbound freight rates in 1969.[2] As is evident in Table 5, pallets were given larger rebates than containers in five out of ten cases. If a service is not fully containerized, i.e. equipped with container berths and run by container ships, pallets are probably more favourably received by the conferences than containers, as containers can waste space on an ordinary liner, and as pallets are more amenable to ordinary cargo handling methods.

It is likely that increased containerization will lead to larger rebates. For example, the Canadian North Atlantic Westbound Conference, serving inbound trade between the British Isles and Canada, introduced a new "Three Tier Tariff," March 21, 1971.[3] A similar structure was also introduced by the Eastern Canada-United Kingdom Conference.[4] The new structure of rates will change the House-to-House container rebate to 15 per cent. A new rebate of 7.5 per cent will be introduced on House-to-Pier and Pier-to-House containers and House-to-House pallets.

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[1] The Financial Post, October 17, 1970.

[2] No explanation can be offered as to why there are larger rebates for containers on the Canada-Australia and the Canada-Brazil routes than on the Canada-UK route, the latter being the only fully containerized service in 1969.

[3] Canadian North Atlantic Westbound Freight Conference. Notice to Shippers and Consignees. Traffic to Canada. Liverpool, December 18, 1970.

[4] Personal correspondence with Mr. Hiland, head of Traffic Rates and Services Division of the Department of Industry, Trade and Commerce.

TABLE 5

REBATES OFFERED ON CONTAINERS AND PALLETS BY SOME CONFERENCES, 1969

Trade Route	Pallets	H-H Containers	H-P, P-H Containers	P-P Containers
Canada-UK	-	7.5%	-	-
Canada-Scandinavia	10%	5%	-	-
Canada-Continent	10%	5%	5%	-
Canada-Mediterranean	2%	5%	2.5%	-
Canada-Australia	10%	10%	5%	-*
Canada-Brazil	10%	10%	-	-
Canada-West Africa	-	-	-*	-*
WCanada-Europe	2 US dol/ton	1.60 US dol/ton	-	-
WCanada-Australia	1 US dol/ton	-	-	-
WCanada-Japan	2 US dol/ton	-	-	-
WCanada-Peru, Chile, the Caribbean	-	-*	-*	-*

Source: Conference agreements filed at the Department of Industry, Trade and Commerce, Ottawa.

Notes: H-H = house-to-house. The container is packed at the place of manufacturing and is not unpacked until the commodities reach their final destination

H-P = house-to-pier. The container is packed at the place of manufacturing, but is unpacked at the foreign port. The service is not integrated.

P-H = pier-to-house. The container is packed at the Canadian port and is not unpacked until it reaches its final destination.

P-P = pier-to=pier. The container is packed at the Canadian port and unpacked at the foreign port.

Canada = Eastern Canada

WCanada = Western Canada

* = the conference imposes a charge for packing and unpacking

Advantages and Disadvantages of the Conference System

A United States government investigation found that conference rates on inbound United States cargo were higher than the corresponding rates on the outbound cargo.[1] This charge of discrimination caused a considerable uproar against the conferences. Evidence of discrimination was also given in a report by the Canadian Restrictive Practices Commission.[2]

Like railway rates, individual liner rates are determined by "what the traffic can bear" and by various cost factors. It has frequently been argued that this system of pricing, which is discriminatory in nature, should be abandoned in favour of one solely based on costs.[3] Therefore, before evaluating the conference system, a discussion of the cost structure and pricing problem of liner shipping is necessary.

The cost structure of liner shipping is similar to that of railroad operations in that when the liner schedule is determined, most costs become fixed. A hypothetical breakdown of costs for liner shipping is presented in Table 6. All vessel expenditure, agency fees, and docking costs can be regarded as fixed costs, and the cargo costs as variable costs. Some port charges vary with the amount of cargo and

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[1] United States Congress. Discriminatory ocean freight rates and the Balance of Payments. A report of the subcommittee on Federal Procurement and Regulation of the Joint Economic Committee, August 1966.

[2] Shipping Conference Arrangements and Practices, pp. 74-77.

[3] S.G. Sturmey, "Economics and International Liner Services," Journal of Transport Economics and Policy, 1 (May, 1967), p. 203.

TABLE 6

HYPOTHETICAL BREAKDOWN OF COSTS FOR LINER SHIPPING

Vessel expenditure	Percent of total costs	Voyage expenditure	Percent of total costs
Wages	28.5	Port charges:	
Payroll tax	0.9	Agency fees	1.3
Welfare plans	1.3	Docking	3.4
Subsistence	2.4	Other port charges	5.6
Stores, supplies and equipment	2.3	Cargo costs:	
Other maintenance expenditure	2.6	Stevedoring	19.2
Fuel	10.9	Other cargo expenditure	7.7
Repairs	3.1	Commissions for freight	0.5
Insurance (hull and engine)	2.6	Other voyage expenditure	3.0
Other insurance	4.4		
Other expenditure of vessel	0.3		
Total	59.3	Total	40.7

Source: William L. Grossman, Ocean Freight Rates (Cambridge, Maryland: Cornell Maritime Press, 1956), p. 4.

some do not. If the table is representative, over 60 per cent of costs are fixed in the short run.[1] If in addition management and depreciation charges were included, the percentage would be larger.

All fixed costs are common costs, i.e. common to all the commodities carried. There is also an element of joint costs, as supply of carriage in one direction leads to supply of carriage in the other direction as well. Ignoring this joint product aspect, if the liner is a monopolist and a profit maximizer, the optimum freight rate for each product could be calculated, as a marginal cost curve for the shipping of each product could be constructed for each possible combination of shipment of other products. No corresponding average cost curve would be possible.[2] Under these circumstances it is difficult to see why so called cost-based pricing ("full cost pricing") would be an improvement on charging "what the traffic can bear," since any allocation of the large portion of common costs is arbitrary. To deny the conferences the right to allocate common and fixed costs on the basis of demand may lead to a lower volume of traffic and there-

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[1]Similar distributions of costs are given in Van den Berg, Containerization, p. 144; Arnljot Strømme Svendsen, Seeverkehr und Schiffahrtswirtschaft (Bremen, 1958), p. 189; D.L. McLachlan, "The Price Policy of Liner Conferences" The Scottish Journal of Economics and Political Science, X (Nov., 1963), p. 328.

[2]George J. Stigler, The Theory of Price, 3rd edition (New York: The Macmillan Company, 1966), pp. 163-165.

fore underutilization of existing resources.[1] Demand-based pricing is also by definition conducive to the flow of international trade. Therefore, when evaluating the conferences, demand based, or discriminatory pricing, should not be the prime issue.

The main argument that has been frequently advanced in favour of shipping conferences is that they are necessary for the stability of world trade. The reasoning is that if competition were free, and if excess capacity occurred, freight rates would fall to the level of handling charges, which would lead to chaos on the world shipping markets.[2] Given the small share of variable costs, the temptation would be great for each liner to accept additional cargo at lower than scheduled freight rates. Rate cutting would then continue, until all rates have fallen to the level of handling charges. This argument was accepted by most shipping circles and was not challenged until quite recently by R.O. Goss and also Esra Bennathan and A.A. Walters.[3] If excess capacity occurred and rates fell and were expected to persist at a low level for some time, the shipowners would

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[1]For a general discussion of cost based versus demand based pricing in transportation, see Merril J. Roberts, "Transport Costs, Pricing and Regulation" in Transportation Economics, A Conference of the Universities - National Bureau Committee for Economic Research (New York: NBER, 1965), pp. 3-43.

[2]Sturmey, British Shipping and World Competition, p. 123.

[3]R.O. Goss, Studies in Maritime Economics (Cambridge: Cambridge University Press, 1968), p. 16; Bennathan and Walters, The Economics of Ocean Freight Rates, pp. 46-49.

presumably try to transfer their ships to more profitable trades. If this were not possible, they would try to wear out capacity instead of replacing it, or simply lay up their ships, until no excess capacity existed, which would cause rates to rise again. The argument also implies that the shipowners ignore long run marginal costs, which are higher than the handling charges. For these reasons, it is highly unlikely that freight rates would fall to the level of handling charges under competitive conditions and excess capacity.

Another advantage claimed for the conferences is that they guarantee a certain stability of rates. The implication is that if there were no conferences, liner freight rates would show the same large fluctuations as tramp rates. It is obvious from Figure 1 that the index of liner freight rates is more stable than that of tramp rates. It must be borne in mind, however, that one of the reasons for this occurrence is that liner rates usually include handling charges, while tramp rates do not. As handling charges do not fluctuate appreciably over time, their inclusion would have a dampening effect. Further, tramps usually carry primary commodities, and therefore the demand for tramp space is determined by the supply and demand for these commodities, which are notoriously unstable.[1] Liners, on the other hand, carry manufactures, the demand and supply of which do not show the same large fluctuations. Therefore, if the elasticity of

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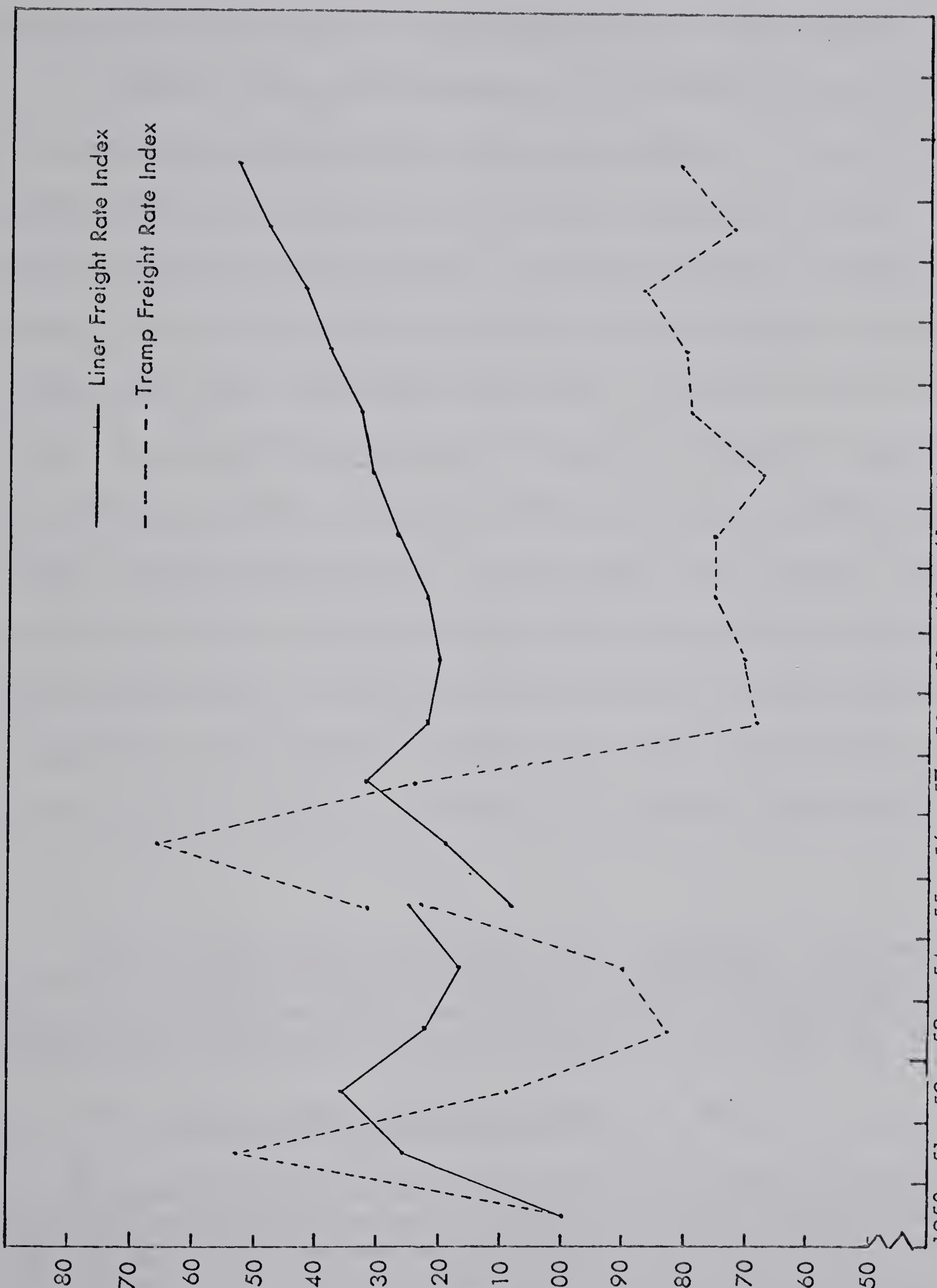
[1]See for example, J.W. Rowe, Primary Commodities in International Trade (Cambridge: Cambridge University Press, 1965), pp. 68-75.

FIG. 1

INDICES OF LINER AND TRAMP FREIGHT RATES, 1950-1967



Source: UNCTAD, TD/B/C.4 /38 / Rev 1 , p.21 .

Notes: 1.1950-1955, 4th quarter of 1950 = 100. 1955 - 1967, 2nd half of 1954 = 100 .

2.The 1950-55 series includes tankers, whereas 1955-67 series does not.

supply of shipping space is approximately equal for liners and tramps, it is highly unlikely that liner freight rates, if competition were free, would show as large variations as tramp freight rates.

Despite these qualifications, it is probably true to say that the conferences do make liner rates more stable. It is well known that administered prices are more stable than competitive prices.[1] A question which needs to be examined is whether stability is necessarily an asset, particularly as it is probably achieved through rates that are higher than under competitive conditions. Substantial barriers to entry, no intraconference competition, and no independent operators on the route are factors which are likely to bring the administered price closer to the monopoly price. On the other hand, national flag rivalry usually prevents a conference from attaining an absolute monopoly.[2] So the rate level of a shipping conference will deviate from that of a monopolist and towards the competitive level to the extent that the conference is vulnerable to internal and external competition.[3]

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[1]Paul A. Samuelson and Anthony Scott, Economics, 2nd Canadian edition (Toronto: McGraw-Hill Company of Canada Ltd., 1968), pp. 562-563; for an advanced study, see Fritz Machlup, The Economics of Sellers Competition (Baltimore: The Johns Hopkins Press, 1952), pp. 469-471.

[2]Marx, International Shipping Cartels, p. 251.

[3]Monopoly profits appear to be scarce. According to O'Loughlin the ratio of net equity earnings to assets of British shipping companies was 3.9 per cent, compared to an average of 9.3 per cent for a sample of 549 companies operating in Britain in 1965 (The Economics of Sea Transport, p. 12). McLachlan has shown that the annual average gross profits for liners were only marginally higher than those for tramps, 1959-61 ("The Price Policy of Liner Conferences," pp. 330-332).

The cost to the economy of a relatively high level of rates must be weighed against the cost of instability of rates. The costs of instability are: (1) costs of keeping abreast of the changes; (2) costs of the additional competitive hazards introduced by fluctuating freight rates; (3) costs of planning for the future.[1] Additional competitive hazards are probably regarded by many businessmen as a benefit not a cost in that risk-taking increases the possibilities of earning large profits. It is likely that some of the other costs could be avoided by the establishment of a forward market.

Conferences also guarantee frequent and regular services. Under free competition it is claimed that the range of services might decline. Why this would occur has not been fully explained. One reason could be that under oligopoly lack of price competition usually encourages service competition. Introduction of price competition could therefore decrease service competition. This argument is similar to that in favor of stability, as it basically involves a comparison of what is most beneficial: frequent services and high and stable rates or less frequent services and lower and less stable rates.

It is impossible to reach a definite conclusion as to whether or not the conferences have had a detrimental effect on world trade. Higher transport costs implies lower total trade, but the higher costs should be weighed against the advantages to the shipper in terms of reliability of services and stability of rates. As shippers in general

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[1] Ferguson et al., The Economic Value of the United States Merchant Marine, p. 266.

appear to favour the conference system, its abolition may decrease the confidence of some exporters to the point of them rediverting the resources to production for the home market.[1]

The conferences can obviously abuse their monopoly power. Conferences have been known to act solely in their own interest to try to keep competitors from operating on their routes.[2] At a recent meeting of the shipping committee of the United Nations Conference on Trade and Development, the developing countries cited several instances of heavy freight increases and surcharges levied against their exports, frequently without any prior notice to, or consultations with shippers.[3] Therefore, even if most conferences usually act in the public interest, there is a need for a safeguard in case they do not, as the flow of international trade is of vital concern to most countries.

Regulation of Shipping Conferences

There are basically four approaches to regulation: (1) the establishment of shippers' councils to serve as countervailing powers to the conferences; (2) participation of a national flag line in a conference; (3) national legislation; (4) international legislation.[4] The four approaches are not mutually exclusive.

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[1]For evidence that shippers are satisfied, see Shipping Conference Arrangements and Practices, pp. 91-92.

[2]Marx, pp. 54-55.

[3]UNCTAD. Report of the Working Group on International Shipping Legislation on its second session, 15-26 February, 1971. TD/B/C.4/86.

[4]For a good discussion of the first three, see Bennathan and Walters, pp. 93-108.

A shippers' council is an organization of shippers, whose sole purpose is to negotiate with the conferences on matters such as freight rates and sailing schedules. They have taken an active part in many countries in negotiating freight rates. There are two disadvantages of a shippers' council. In the first place it is difficult to ensure that the large shippers do not use their power to obtain discriminatory rates in their favour. Secondly, the councils may not be adequately concerned with the task of promoting external competition.[1]

Many developing countries have chosen to establish a national flag line which can influence the actions of a conference from inside. The only major advantage of a national flag line is that it will save some foreign currency. In practice, the benefits have turned out to be small as the national flag lines have frequently required substantial subsidization.

The most extensive national legislation directed against conferences can be found in the United States. The present legislation has a long history.[2] The latest regulations rule out deferred rebates, the use of fighting ships, barriers to entry, and generally retaliation and discrimination against shippers.[3] Dual rate contracts are legal, provided they are equally available to all shippers; provided that the difference between contract and non-contract rates does not exceed 15

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[1]Ibid., p. 95.

[2]Marx, International Shipping Cartels, pp. 105-136.

[3]A fighting ship is a vessel run by a conference, charging lower than normal rates in an attempt to try to eliminate non-conference competition from the route.

per cent; provided they are not detrimental to the commerce of the United States, against the public interest, unjustly discriminatory or unfair between shippers, exporters, importers or ports, or between exporters from the United States and their foreign competitors.[1] The shipper should not be forced to divert his cargo from its natural route, if the conference did not provide service on this route. Only c.i.f. cargo was to be included in the contract. It was stipulated that the conference should give 90 days notice before all rate increases, and the shipper should give 90 days notice before he withdrew from conference services. Penalties to the shipper for breaking the agreement should be actual cost to the conference, i.e. the freight earned on the diverted shipment minus handling charges.

The legislation in the United States has met a vast amount of criticism from shipping circles. It was felt that the law made the dual-rate contract useless. Particularly, the regulation that f.o.b. or f.a.s. agreements did not come under the contract was thought to be unfair.[2] The penalty for breaking the contract was also thought to be too low to be effective. There was also a provision that the Federal Maritime Commission could legally demand documents located abroad. This, not surprisingly, created considerable opposition among other countries. Many European countries have since enacted laws which can be used to prohibit their shipping lines and conferences

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[1] Goss, Studies in Maritime Economics, pp. 25-30.

[2] Goss, Studies in Maritime Economics, p. 31.

from furnishing information to the Federal Maritime Commission.[1]

In 1965, a report was issued by the Restrictive Practices Commission in Canada on Shipping Conference Arrangements and Practices. This report found the conference system necessary:

> Although the member lines lessen competition within the meaning of the Combines Investigation Act, the public interest would not be served by excessive rate competition and instability in the liner trades.[2]

It was also recommended that the conference tariffs should be made available to the general public, that the shipper should not be obliged to ship more than 85 per cent of his goods on conference vessels, that the contract period should be ninety days, that a rate increase should be announced ninety days before its proposed implementation, and the shipper should have sixty days to negotiate the increase if he so desires.[3] The spread between contract and non-contract rates should not exceed 15 per cent. The shipper should be free to go outside the conference, if no space were available within a certain time period. A shipper should not be forced to divert his cargo from its natural route. If a shipper breaks his contract, he should be liable to pay damages.[4] It also recommended the establishment of a shippers' council.

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[1] Federal Maritime Commission. Eighth Annual Report, Washington, D.C., 1969, p. 53.

[2] Shipping Conference Arrangements, p. 100.

[3] Ibid., pp. 101-102.

[4] Ibid., p. 102.

Subsequently, most conferences operating on Canadian shipping routes filed their tariffs with the Industrial Traffic Branch of the Department of Industry, Trade and Commerce. A shippers' council was established under the auspices of the Canadian Export Association. According to the secretary of the Canadian Export Association, Mr. McAvity,it has been holding and will continue to hold meetings with each of the conferences for discussion of matters such as rate-making policy, and scheduling of services.[1]

In 1970 a parliamentary bill was passed, exempting certain conference practices from the regulations of the Combines Investigation Act.[2] The Act is referred to as the Shipping Conferences Exemption Act. The Act legalizes pooling agreements, control of entry, and the dual rate contract. Some of the recommendations of the Restrictive Practices Commission were accepted. The length of the contract period is stipulated to ninety days. The difference between the contract and non-contract rates is set at 15 per cent. The following practices fall under the Combines Investigation Act: (1) the deferred rebate system; (2) fighting ships; (3) refusal to transport goods for a shipper because that shipper has used a non-conference vessel; (4) attempts at preventing a non-conference carrier the use of ports and other facili-

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[1]Information obtained from personal correspondence with Mr. McAvity.

[2]The House of Commons of Canada. Second Session, Twenty-eighth Parliament, 18-19 1969-1970. Bill C-184. An Act to exempt certain shipping conference practices from the provisions of the Combines Investigation Act.

ties. There is also a provision that the conferences should file a schedule of their rates with the Canadian Transport Commission.

The Act relies heavily on United States law with its views of the dual-rate contract, pooling agreements, fighting ships, and various discriminatory practices. It does not contain any of the more controversial aspects of United States law, such as the c.i.f. provision, the size of the fine for breaking a contract, or the right to request information from foreign countries.

The following recommendations of the Restrictive Practices Commission were not accepted: (1) no shipper should be forced to re-divert his cargo from its natural route; (2) no shipper should be penalized from shipping on a non-conference vessel, if no space on a conference vessel were made available within a reasonable time. The Minister of Transport did not explain, when the bill was introduced in Parliament, why these recommendations were not included in the Act. The records of the parliamentary debates indicate that these issues were not discussed in the debates that followed.[1]

D.B. Marx gives an account of developments in other countries, but as his book was published in 1953, the information is out of date.[2] Apparently, many other countries apart from the United States and Canada have powers to control shipping conferences.[3] For example,

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[1] House of Commons Debates. Vol. 114, No. 72, 2nd Session, 28th Parliament, pp. 3997-4001, pp. 8786-8777.

[2] Marx, International Shipping Cartels, pp. 84-105.

[3] Goss, Studies in Maritime Economics, footnote, p. 22.

Australia has introduced legislation under which the Australian government is represented at rate negotiations.[1]

National legislation is not an ideal solution in trying to control various malpractices by the conferences, as it is unilateral. If two countries trading with each other regulate ocean shipping between them, but do not coordinate their policies, considerable confusion is likely to result. Therefore, if legislation is deemed necessary, it should be international in character. The organization that is probably most suitable for this purpose is IMCO (Intergovernmental Maritime Consultative Organization), which was founded in 1958. It has as its main objectives: (1) to facilitate co-operation between governments on technical matters regarding shipping and to ensure high standards in the safety and efficiency of navigation; (2) to discourage restrictive and discriminatory practices affecting the international shipping trade; (3) to provide for exchange of information among governments on the above matters and to draft conventions etc., concerning the same matters.[2] IMCO has not taken any action so far against the conferences, even though the issue would presumably fall under the second heading. However, in a recent resolution it was felt that more extensive issues of Maritime law should be considered, particularly those that emerge as a result of the cooperation between IMCO and other organizations

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[1]P.E. Stonham, "Conference and Competition in Australia's Overseas Liner Shipping," The Economic Record, 46 (June, 1970), pp. 197-208.

[2]UNCTAD, TD/B/C.4/32/ Rev 1, p. 4.

within the United Nations system, particularly UNCTAD.[1]

Conclusion

Cargo liners carry more than 20 per cent of the volume of world trade and very likely a larger percentage of the value of world trade. At present, liner shipping is in a period of change because of the introduction of containerships. This development is likely to lead to changes in the present form of conference organization. The reason for this conclusion is that containerized transport requires a large degree of co-operation not only among conference members, but also among the conferences.

There are fourteen conferences serving Canadian exports. Eight of these serve jointly Canadian and United States exports. Containerization in Canada is relatively recent and therefore its full impact on Canadian export shipping has not yet been realized.

It is impossible to determine whether the conferences have been detrimental or advantageous to world trade in manufactures.

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[1] UNCTAD, Review of studies and activities in the field of shipping and ports carried out by other institutions within the UN system by other inter-governmental organizations and by non-governmental organizations. Report by the UNCTAD secretariat, TD/B/C.4/49/Add. 3, Annex II, p. 1.

UNCTAD's program in the field of shipping is quite extensive. The work instituted in 1965 contains the following topics: (1) The establishment of national and regional consultation machinery (Shippers' councils); (2) Level and structure of freight rates, conference practices and adequacy of shipping services; (3) improvement of port operations and connected facilities; (4) establishment and expansion of merchant marines in developing countries; (5) reviews of current and long term aspects of maritime transport. (UNCTAD, Report of the Committee on Shipping in its first session, 8-23 Nov., 1965. TD/B/36 and Add 1/p. 3).

There is insufficient evidence against them to support an outright condemnation. A case could be made, however, for some kind of regulation of or countervailing power to the conferences, whether this takes the form of shippers' councils or international legislation.

CHAPTER 3

EMPIRICAL EVIDENCE ON LINER FREIGHT RATES

In this essay, freight rates on some Canadian overseas export routes will be examined. The focus of attention will be: (1) to what extent the liner conferences operating on Canadian outbound routes behave as monopolists; (2) to what extent the conferences offer quantity rebates; (3) the effects of freight rates of changes in distance and stowage; (4) whether or not there is any difference in behaviour between the heavily regulated United States (joint) conferences and the less regulated Canadian ones.

In order to set the stage for the models, a discussion of factors influencing freight rates is necessary.

Factors Claimed to Influence Liner Freight Rates

In many studies and discussions of liner freight rates, twenty-seven determinants have been quoted. These determinants were first enumerated in 1940, but it is believed that they are still valid.[1]

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[1]They are: character of cargo, volume of cargo, availability of cargo, susceptibility to pilferage, susceptibility to damage, value of goods, packing, stowage, relationship of weight to measure, heavy lifts, extra lengths, competition with goods from other sources, cargo via competitive gateways, competition from other carriers, direct costs of operating distance, cost of handling, lighterage, special deliveries, fixed charges, insurance, port facilities, port regulations, port charges and dues,canal tolls, port location, and the possibility of securing return cargo. (The Federal Maritime Commission. Fact Finding Investigation No. 6. The Effects of Steamship Conference Organization, Rules, Regulations and Practices upon the Foreign Commerce of the United States. Washington, D.C., 1965, Mimeographed publication, pp. 90-143.

Before discussing some of the more important ones, it is useful to distinguish between cargo-type determinants and non-cargo-type determinants.

Non-Cargo-Type Determinants. Non-cargo-type determinants are factors that vary with conditions on the shipping route, with conditions on the shipping lines serving the route, or with both. Most, but not all of these determinants enter the fixed cost schedule of the liner firm. As mentioned above, when the liner schedule is fixed, most of the costs become fixed as well.[1] Non-cargo-type determinants therefore include all the factors that enter "Vessel Expenditure" in Table 6, and some of the port charges.[2] If any of these costs are higher on one shipping route than another, it is likely that the level of freight rates will be higher as well. For example, larger distance implies higher fuel costs and should therefore, *ceteris paribus*, be reflected in higher freight rates.[3]

Port facilities and port regulations may sometimes have an adverse effect on costs. For example, if the port does not have sufficient depth for the vessel, the cargo must be reloaded on barges, which with their shallow draught can use the port. This, of course, means that the shipping line will incur an additional cost.[4]

The possibility of securing return cargo also has an effect on

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[1]See above, p. 49.

[2]See above, p. 50.

[3]For further discussion on the effect of distance, see below, p. 78.

[4]The exception is if the ship is a LASH-ship, when the cargo is always loaded on barges.

the level of freight rates. If the liner is fully loaded on the outbound journey, but almost empty on the inbound journey, the cargo on the outbound journey must bear a larger share of fixed costs than it would if both journeys were balanced.

Other interrelated determinants are port location and availability of cargo. If the liner in serving the port has to deviate from its "normal" route, cargo from this port will usually have a higher freight rate. However, aluminum from Kitimat, B.C. has a lower rate than that from Vancouver, even though Vancouver is the base port. This indicates that it is worthwhile for the liner to call at Kitimat because of the large amounts of cargo available there.

Cargo-Type Determinants. Cargo-type determinants can be divided into those which are cost-based and those which are revenue-based. If it costs more to ship one commodity than another, then it can be assumed that the commodity with larger costs will have a higher freight rate. Such cost-based determinants are: the general character of the cargo, its susceptibility to damage and pilferage, packing, stowage, relation of weight to bulk.

The term character of cargo means that cargo which is explosive, poisonous, or requires special treatment, receives a higher freight rate, because of the extra handling costs incurred. If the cargo is susceptible to damage or pilferage, claims for losses or damages against the carrier may be high.[1] Susceptibility to damage can to some extent

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[1]Carriers are normally insured against these risks. However, these insurance rates are to some extent determined by the loss experience of the carrier. Large losses mean higher insurance rates. Therefore the conference tries to compensate for these possible costs by levying higher rates on this type of cargo. (Fact Finding Investigation, pp. 94-95).

be lessened by packing, which also enters into stowage. For example, a well packed aircraft engine stows more easily and is better protected than one that is not packed, and should therefore receive a lower rate.

Stowage not only refers to the act of packing, but also in shipping circles to the relationship of weight to bulk.[1] A ship has two capacities: a weight capacity and a space capacity. If a ship is fully loaded with cotton, its weight capacity will be underutilized. Similarly, if it is loaded with iron ore, its space capacity will be underutilized.[2] Therefore, many rates are quoted on a W/M basis, i.e. weight or measurement (per 40 cubic feet or per 2000 pounds). This means that the applicable rate will be the one which gives the largest revenue to the conference. If a ton of the commodity occupies more than 40 cubic feet in space, charges will be on a measurement basis. The freight rate quoted should be interpreted "per 40 cubic feet." If a commodity stows less than 40 cubic feet, it will be charged per ton.

No information is available on the origin of the 40 cubic feet or 2000 pounds formula.[3] Perhaps the average ship in the beginning of the century, when this formula came in use, could hold either 40,000 cubic feet or 1000 tons, i.e. 40 cubic feet per ton. If this is the

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[1] Webster's New Standard Dictionary (1958) defines stowage as "act of packing closely," "space for stowing goods," "charge made for stowing goods." The relationship of weight to bulk for a commodity is usually called the stowage factor.

[2] It is often believed that the space capacity is a more serious constraint than the weight capacity. Therefore a commodity's stowage factor in a sense reflects the opportunity cost to the shipping line of carrying that commodity.

[3] Fact Finding Investigation, p. 101. Sometimes the formula 40 cubic feet or 2240 pounds (long tons) is used.

case, there is a strong suspicion that the relation may be highly obsolete due to the significant changes in ship design during the last decades. Sven Gedda and Arne Koch arrive at an average stowage figure for ships of approximately 70 cubic feet per 2240 pounds.[1] If this figure is correct, the formula discriminates against bulky commodities.[2]

The only cargo-type determinant that is revenue-based is the value of the commodity. High-valued commodities usually carry high rates for two reasons: (1) a high value per ton is interpreted by the conferences as an indication that demand is inelastic - the commodity can therefore bear a relatively high freight rate; (2) the higher the value, the larger the claims against the carrier for losses and damages if the carrier is at fault.[3] Thus, value is both a cost-based and a revenue-

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[1] Sven Gedda and Arne Koch, Principer för fraktsättning vid sjötransport av containers (Bergen: Institute for Shipping Research, 1966), p. 28.

[2] This would support the contention that the space capacity is a more binding constraint than the weight capacity.

[3] For further discussion of demand based pricing, see above, pp. 48-51.

The presumption that the value of a commodity gives an approximate indication of its elasticity is a common one in transportation circles. "The freight rate on a valuable article, even though high, is a small proportion of the price of the article at destination. The rate on a cheap article, though low, is a substantial proportion of the price. It follows that a high rate will affect the price of, and the demand for, a cheap article much more than it will for a valuable article. And anything which restricts the demand for an article will, as we have noted, restrict the demand for its transportation. Thus high rates restrict the movement of cheap commodities but do not restrict the movement of valuable articles to so great an extent." (D. Philip Locklin, The Economics of Transportation (Homewood, Ill.: Richard D. Irwin, Inc., 1960), p. 145).

But this belief is usually qualified. "There is, however, no necessary relationship between the value of a commodity and its ability to bear high rates...If a very high valuable article can be produced almost as cheaply at B, where it is to be consumed, as at A, the demand for the service of transporting it between A and B is very little... The fact that the commodity is of considerable value makes no difference." (Ibid.)

based cargo-type determinant.

Determinants Which are Both of the Cargo-Type and the Non-Cargo-Type. Volume of cargo, competition from other carriers, competition from goods from other sources, competition from cargo via competitive gateways, are all both revenue-based, cargo-type determinants and non-cargo type determinants. They are cargo-type determinants inasmuch as they affect different commodities, and they are non-cargo type determinants inasmuch as they affect different shipping routes.

Volume of cargo and competition from other carriers are interrelated determinants. Large shipments of a certain commodity indicate that the commodity could be carried by tramps. So in order for the conference to be able to compete, it must set a lower freight rate.[1] The conference is also inclined to give the shipper a lower freight rate, because a large and steady volume of cargo is beneficial, as it implies security of revenue.

Competition from other carriers can also mean competition from independent carriers and from air transport. This competition is particularly important for relatively high-valued commodities, i.e. commodities for which the freight rate is high.[2]

The fact that cargo can follow alternative routes is apparently an important constraint for North American conferences (Competition from cargo via competitive gateways). The United States Atlantic and Gulf

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[1] Open rates are usually quoted on such commodities as grain. An open rate allows each carrier in the conference to set his own rate.

[2] It is sometimes claimed that the conference rate should be at least 10 per cent lower than the air rate to be competitive. (Fact Finding Investigation, p. 118).

Conferences are in competition with each other, and so are the Canadian and United States Conferences. Again, competition is usually restricted to certain desirable (high-valued) commodities.[1]

If competition from goods from other sources is strong in a particular market, the conference will be fairly restricted on how high it can set the freight rate. If the rate is set too high, the commodity may not move at all, and the conference will lose the freight revenue that could be derived from this particular commodity.

Cost of handling can be both a non-cargo-type determinant and a cargo-type, cost-based determinant, as the cost varies both between ports and between commodities.

Which of these factors are most important? If the structure of freight rates on a given route is to be explained, only cargo-type determinants need to be considered, as the non-cargo-type determinants are held constant. Similarly, if the level of freight rates, i.e. the variation of rates between different routes is to be explained, cargo-type determinants do not enter into the picture, while non-cargo-type determinants are the important ones.

Previous Statistical Studies

Chinitz, in 1956, found evidence of correlation between high-valued commodities and high freight rates and low-valued commodities and low freight rates, but in the middle range no significant corre-

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[1]For evidence on competition between Canadian and United States ports, see "Container operators get cream of cargo," The Edmonton Journal, Dec. 29, 1970.

lation was found.[1]

Moneta regressed freight rates on values, using a log-linear relationship.[2] The regression coefficients varied between 0.23 and 0.29, and the intercept terms appeared to be positively correlated with distances.[3]

The shipping committee of UNCTAD has engaged in a large variety of studies, one of which examined in detail the liner trade and freight rates between France and Morocco.[4] The first hypothesis tested was that commodity freight rates are positively correlated with commodity values. The Morocco-Northern France route displayed a correlation coefficient of 0.33 (42 observations), while the return route had a correlation coefficient of 0.74 (46 observations). The difference between the two figures was attributed to different conditions of the two routes. The power of the conference to practice price discrimination on the Morocco-Northern France route is restricted, because of the presence of a very powerful shipper in Morocco (the commodities are almost exclusively

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[1]Benjamin Chinitz, "An Analysis of Ocean Liner Freight Rates," Abstract from a paper given at the 1955 meeting of the Econometric Society, Econometrica, 24 (July, 1956), pp. 351-352.

[2]Carmellah Moneta, "The Estimation of Transportation Costs in International Trade," Journal of Political Economy, LXVII (Feb., 1959), pp. 41-58.

[3]Gedda and Koch also found some evidence on a positive correlation between values and freight rates. (Principer för fraktsättning, p. 28).

[4]UNCTAD. Level and Structure of Freight Rates. Route Study. The Liner Trades between France and Morocco, TD/B/C.4/61.

foodstuffs).[1] Another contributing factor is that Morocco has a national flag line participating in the conference serving the route. Presumably, one of its main concerns, as a national flag line, is to act in the interest of the Moroccan shippers. Depending on its bargaining power, this may have further reduced the discriminatory power of the conference.

The high correlation coefficient on the Northern France-Morocco route was explained by the following factors: (1) a large number of diverse items are exported in small quantities by a large number of shippers, who are not organized. This means that there is no power to counteract the conference; (2) The fact that the shipments are small excludes the possibility of tramp competition; (3) As there is a downward pressure on rates on the northbound route, the shipowners have a strong incentive to charge what the traffic will bear on the southbound route.

The next hypothesis tested was that there is a direct relation between stowage and the freight rate.[2] On the Morocco-Northern France route, the correlation coefficient was -0.04, and on the return route, 0.67. This again indicates a considerable difference between the northbound and the southbound route. No attempt at explanation was given.

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[1]This leads to bilateral monopoloy, in which case the final outcome is indeterminate with respect to equilibrium price and quantity. All that can be said is that the final price will fall within a certain range with the monopoly price as a higher limit. It is therefore likely that the final price will be lower than the single monopoly price.

[2]By "stowage" is meant the stowage factor, i.e. the space a ton of the commodity occupies.

The third hypothesis tested was that there is an inverse relation between quantity shipped and the freight rate. On the northbound leg, the correlation coefficient was -0.17, and on the southbound leg, -0.34. Therefore, the tendency, if any, for freight rates to be negatively correlated with quantities moved is very weak.

Finally, freight rates were correlated with the share of the exporting country's exports in the importing country's imports, in order to test the hypothesis that freight rates depend on the competition prevailing in the buying country. No statistical relationship was found. A few, not very successful, attempts were also made to explain interport differences in freight rates in terms of distance, historical reasons, physical conditions, quantity of cargo moved between ports, local domination of shipping lines, and cargo handling charges.

It can be concluded that the available studies show that the investigated conferences are price discriminators in the sense that rates vary with unit value.[1] The evidence on the influence of stowage, distance, various competitive conditions, and cost factors in general is scant.[2] The models presented below will be used to analyse the effect of some of these factors on the structure of rates on some Canadian export commodities.

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[1]For a discussion on the possible relation between unit value and elasticity, see footnote 3, p. 69.

[2]Another study by UNCTAD shows that distance and stowage are significant in explaining the variation in freight factors. (UNCTAD, Level and Structure of Freight Rates. The Estimation of Freight Factors.TD/B/C.4/47). A freight factor is a freight rate divided by the f.o.b. or c.i.f. value of the commodity it applies to. As the freight factors were based on the difference between f.o.b. and c.i.f. values they include insurance as well. Insurance rates are not standardized but are generally determined by the experience of the risk and the judgement of the underwriter. (Marine Insurance. Notes and Comments on Cargo Insurance. The Insurance Company of North America, 1962, pp. 27-28). It is therefore possible that variations in insurance rates may have introduced certain biases in the analysis.

The Models

Two cross-section models were set up. Cross-section analysis is most suitable, as the purpose of the study is to determine statistically the importance of some factors in a given freight rate structure.

Model 1. Model 1 is intended to quantify the effect of some variables on the freight rate structure on a certain route (for example Montreal-United Kingdom).[1] That means that only cargo-type determinants need to be examined.[2]

The model is

$$F_{ij} = f(\underset{(+)}{U_i}, \underset{(+)}{S_i}, \underset{(-)}{Q_{ij}})$$

F_{ij} = freight rate of commodity i on route j (dollars/short ton)
U_i = unit value of commodity i (dollars/short ton)
S_i = stowage of commodity i (cubic feet/short ton)
Q_{ij} = quantity of commodity i moved in the previous year on route j (short tons)

These variables should now be fairly self-explanatory. As mentioned above, the liners claim to charge what the traffic can bear: the higher the value, the higher the freight rate. This is a form of price discrimination. So the coefficient of U_i will give an indication of

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[1]The rates of thirteen conferences and three independent operators are analysed. The independent operators have monopoly on their routes and cover trade between Montreal and the Caribbean, Montreal and South Africa, and Vancouver and South Africa.

[2]To recapitulate, these are: character of cargo, susceptibility to damage and pilferage, packing, stowage, relation of weight to measure, handling charges, volume of cargo, competition from other carriers, competition from goods from other sources, and from cargo via competitive gateways.

the monopoly power of a given conference or independent operator. The coefficient of S_i, if significant, will indicate the influence of bulk. Given the same weight, a bulky commodity would be expected to carry a higher freight rate than one that occupies less space. The variable Q_{ij} is included to test the hypothesis that conferences and independent operators grant reductions in freight rates for those commodities which move in large quantities. Quantity moved in the previous year is a more appropriate variable than quantity moved in the present year, as the liners most likely base their predictions for the present year on the cargo movements in the previous year.

The cargo-type determinants not included in the model deserve some comment. Handling charges are one of the most important cost items in the liner balance sheet.[1] Therefore, insofar as they vary between commodities, they should be included here. This was not possible for lack of data.[2] The danger of pilferage is reflected in the value of the commodity, while susceptibility to damage, character of cargo and packing are probably of minor importance for the commodities selected.

The variable for volume of cargo also reflects competition from tramps, i.e. competition from other carriers. When this study was undertaken, it was not possible to integrate competition from goods from other sources as a variable, as the required import statistics were not avail-

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[1]See above, p. 49 , Table 6, item for stevedoring.

[2]The publication Ports of the World gives some information on handling charges in a few ports, but the information is far from complete.

able. Competition with cargo via competitive gateways apparently affects some goods more than others - the high-valued commodities. Therefore interconference competition will tend to lower the coefficient for unit value.

Model 2. Model 2 is intended to test the significance of some factors in explaining the variation of a freight rate for a given commodity over different trade routes. This time only non-cargo-type determinants need to be considered.[1]

The model is

$$F_{ij} = f(\underset{(+)}{A_j}, \underset{(-)}{N_j}, \underset{(-)}{Q_{ij}}, \underset{(+)}{D})$$

F_{ij} = freight rate of commodity i on route j (dollars/short ton)

A_j = distance between the Canadian port and the foreign port on route j (nautical miles)

N_j = number of independent competitors on route j

Q_{ij} = quantity of commodity i moved in the previous year on route j (short tons)

D = dummy variable. D = 0 if cargo is shipped by a conference, D = 1 if cargo is shipped by an independent operator.[2]

Variable A_j is included to test the hypothesis that freight rates vary directly with distance. There is some evidence that distance is a less important factor in the freight-rate-making procedure than is

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[1]These are: direct cost of operating, distance, cost of handling, lighterage, special deliveries, fixed charges, insurance, port facilities, port regulations, port charges and dues, canal tolls, port location, the possibility of securing return cargo, availability of cargo, volume of cargo and competition from other carriers, from goods from other sources, and from cargo shipped via competitive gateways.

[2]If a conference and independent operators are competing on a route it is assumed that the commodity is shipped on a conference vessel because of the conference rebate. If an independent operator monopolizes a route, there is obviously no alternative as far as liners are concerned.

usually believed.[1] According to Table 6, above, fuel costs account for approximately 11 per cent of total costs. Therefore a variation in fuel costs may be offset by a variation in port charges or in stevedoring expenses which constitute 20 per cent of total costs. It is also believed that greater distance affects the transit time of the cargo. Longer transit times are obviously disadvantageous to the shipper. The liner operator may therefore try to compensate the shipper by charging a lower freight rate.[2]

Quantity of cargo is included for the same reasons as in the previous model, i.e. to test the hypothesis that the conferences and independent operators give volume rebates.

It could be expected that the larger the number of independent operators (N_j) serving the same route as the conference, the lower the freight rates. There is also a suggestion that the smaller the conference, the larger its monopoly power.[3] Therefore, an independent operator which has a monopoly on a certain route, would be expected to have a higher rate structure than a conference (variable D).

The selected variables constitute only a few of the many non-cargo-type determinants. The overriding problem in this area is the data problem. One attempt was made to include heavy lift charges as a proxy variable for the level of handling charges on the different routes. The results were unsatisfactory.

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[1] Fact Finding Investigation, p. 129.

[2] Fact Finding Investigation, p. 129.

[3] Ferguson, p. 124.

The Data

The year chosen for study is 1969, as it was the most recent year for which freight rates were available on a comprehensive basis.

A sample of twenty-seven commodities was chosen on the basis of several criteria. As the same commodities were going to be utilized in the second part of this study (the determinants of Canadian exports), the main initial criterion was that the commodities had to be fairly significant Canadian export products, shipped to a large number of countries.[1] They also had to be typical liner cargoes (which excludes grains and most ores) and show a reasonable variability in unit value, stowage, and degree of manufacturing. Table 16 shows the commodities, their unit value, stowage, and degree of manufacturing.

The rates of thirteen conferences and three independent operators were included in the analysis. These were chosen to include those covering Canada's most important export routes (with the exception of Canada's trade with the United States). Most conference agreements were available at the Industrial Traffic Branch of the Department of Industry, Trade and Commerce, Ottawa. The Burma-India-Pakistan-Ceylon Freight Agreement, the tariffs of Saguenay Shipping, of Nedlloyd Lines, and of Kerr Steamship Company (the last three are independent operators) were all obtained by personal correspondence with the shipping lines.

Freight rates are usually quoted on a weight basis (per 100 lbs,

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[1]By significance is meant that the value of exports in 1969 should at least be greater than 5,000,000 dollars. See Table 20, Appendix.

per 2000 lbs,or 2240 lbs), on a measurement basis (per 40 cubic feet), or on a weight or measurement basis (per 40 cubic feet or per 2000 lbs - occasionally per 2240 lbs - whichever yields the highest revenue to the conference). Sometimes value rates are used.[1] Some conferences quote their rates in American dollars (all joint conferences and Ned-Lloyd Lines). It is not uncommon that rates are quoted in both long tons and short tons within a given rate schedule. The rates on wood-pulp and newsprint depend on the size of the individual bales, and the rate on plywood on the thickness of each sheet. Some conferences charge different rates on machinery depending on whether it is packed or unpacked. In each rate schedule there is a "General Cargo" rate which applies to all commodities which are not otherwise specified.[2]

In order to make rates comparable, they had to be converted to a uniform basis. The unit chosen was Canadian dollars per 2000 lbs. Short tons were selected instead of long tons as short tons (2000 lbs) are numerically easier to work with. The conversion procedure relied heavily on information about stowage factors. If a rate is to be converted from a weight or measurement basis to a weight basis only, the number of cubic feet occupied by a ton of the commodity must be known. If it occupies 40 cubic feet, no conversion is needed as the revenue would be the same regardless whether it was calculated on a weight or

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[1] For example, on the Montreal-United Kingdom route, the general cargo rate on commodities valued over 5,000 dollars per ton is 2 per cent of the value.

[2] For a sample page of a conference tariff, see Table 24, Appendix.

a measurement basis. However, if the commodity occupied 50 cubic feet, it should be charged on a measurement basis, i.e. $\frac{50}{40}$ times the quoted freight rate. If it occupied 30 cubic feet per ton, the quoted rate is the correct one, as it would be charged on a weight basis.

Stowage factors were obtained from various sources. Apart from those for copper alloys, aluminum,sheet and strip steel, steel bars, aircraft engines, automobiles and chassis, and telephone apparatus, they were obtained from R.E. Thomas, The Properties and Stowage of Cargoes.[1] The stowage factor for automobiles was computed from weights and measurements given in information brochures on various American cars (Chrysler, Ford, Chevrolet, and Pontiac). All others were obtained from personal correspondence with the manufacturers. In this context, it should be emphasized that stowage factors are notoriously unreliable, as they vary considerably due to packing.

The stowage factors used are presented in Table 16.[2] As is apparent in the table, the stowage factors for construction machinery, agricultural machinery, card punching and sorting machinery, and aircraft machinery are missing, because of the large variations in stowage within each commodity group. The rates for these commodities are therefore converted to dollars per cubic foot, rather than dollars per 2000 pounds. The corrected freight rates are presented in Table 18.[3]

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[1]R.E. Thomas, Stowage: The Properties and Stowage of Cargoes, 5th edition, revised by O.O. Thomas (Glasgow: Brown and Son & Ferguson, 1963).

[2]See appendix.

[3]See appendix.

Unit values were compiled from Canadian export statistics for 1969.[1] The quantities of Canadian exports moving on different routes were obtained from the 1968 Shipping Report.[2] As this publication does not give detailed information on the movement of resins, copper tubing, nuts and bolts, and telephone apparatus, quantities for these commodities were obtained from the 1968 export statistics. The distribution of General Cargo in the Shipping Report was assumed to be valid for these commodities as well. No quantity data were available for construction machinery and agricultural machinery, but values were used instead. This limitation is not too serious, since these commodities never enter the regressions on Model 1 (as no quantity data are given, no unit values can be calculated).

For the number of independent competitors, see Table 4. Estimates of distances between the base ports covered are taken from a map, The World, published by the Surveys and Mapping Branch of the Department of Energy, Mines and Resources in 1967.[3]

Statistical Estimation and Results

Model 1. Both a linear and a log-linear relation were tested and twenty-seven equations were run, using ordinary least squares regression analysis. The log-linear relation gave uniformly better results.

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[1] DBS. Exports by Commodities, December 1969.

[2] DBS. Shipping Report, Part 1. International Seaborne Shipping. The 1968 data were made available by the DBS.

[3] See Table 17, appendix.

The twenty-seven equations covered most major Canadian export routes. It was felt that it was not necessary to include traffic originating in Toronto, partly because Toronto only handles a small percentage of the total quantity of cargo and partly because the conference which handles Montreal traffic handles that of Toronto as well. The results of the log-linear relation are presented in Table 7.

The results of the regressions show that the corrected coefficients of determination vary between 0.667 for Montreal to Sweden, to 0.897 for Vancouver to France, Belgium and Holland. The F-values vary between 12.78 and 53.85, all being significant at the 5 per cent level, which indicates that there is a significant statistical relation between the postulated variables. Both the rates set by the Canada-United Kingdom Conference and those set by the Canada-Scandinavian Conference exhibit relatively low coefficients of determination.[1] Presumably factors other than those tested must play a fairly important role here. It is possible that shippers on these routes have been able to obtain various rate adjustments for Canadian exports in order to be able to compete in these markets. For example, the conferences claim that it is their practice to grant rate reductions to any reasonable extent in order to encourage commodities to move on their trade route.[2] As the Montreal-United Kingdom trade is the most important liner trade, in terms of volume of cargo moved, it is possible that shippers have

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[1]So do the Montreal-South Africa route and the Montreal-Jamaica route. These are both covered by a single independent operator.

[2]Fact Finding Investigation, p. 204.

TABLE 7

RESULTS FROM LOG-LINEAR REGRESSIONS ON MODEL 1

Route	No.	Interc. (log.)	U (+)	S (+)	Q (-)	$\bar{R}^2$	F	S.e.
M-UK	21	-1.01	0.3555	0.5902	0.00028	0.668	14.14	0.468
			(4.06)*	(4.18)*	(0.021)			
M-F.,B.,H.	22	-0.77	0.3607	0.5528	-0.00138	0.8033	29.58*	0.325
			(6.00)*	(5.85)*	(-0.131)			
M-Ge.	22	-0.73	0.3600	0.5473	-0.0058	0.806	30.11*	0.323
			(6.05)*	(5.84)*	(-0.58)			
M-De.	22	0.16	0.2775	0.4953	-0.0008	0.669	15.18*	0.377
			(3.86)	(4.53)*	(-0.089)			
M-Sw.,No.	22	0.34	0.2493	0.5111	0.0059	0.6671	15.02*	0.374
			(2.81)*	(4.55)*	(0.52)			
M-Sp.,It.	21	-0.80	0.3769	0.5702	0.0111	0.7109	17.39*	0.412
			(4.85)*	(4.62)*	(0.900)			
M-Israel	21	-0.50	0.3303	0.5816	0.0075	0.719	18.06*	0.393
			(4.06)*	(4.79)*	(0.67)			
V-UK	17	-1.16	0.3361	0.7975	-0.0098	0.8724	37.77*	0.322
			(5.14)*	(8.31)*	(-1.23)			
V-F.,B.,H.	19	-1.30	0.3448	0.8507	-0.0059	0.397	53.26*	0.273
			(6.20)*	(9.78)*	(-0.874)			
V-Ge.	19	-1.19	0.3422	0.7974	-0.0021	0.8834	46.48*	0.293
			(5.90)*	(8.60)*	(-0.259)			
V-De.	20	-1.15	0.3509	0.7812	0.0039	0.889	51.08*	0.284
			(6.61)*	(9.21)*	(0.51)			
V-Sw.,No.	20	-0.94	0.3383	0.7639	0.0063	0.893	53.85*	0.272
			(6.56)*	(9.40)*	(0.77)			
V-Sp.,It.	20	-0.99	0.3357	0.7523	-0.0039	0.870	43.34*	0.296
			(6.05)*	(8.51)*	(-0.579)			
V-Israel	20	-0.62	0.3166	0.7235	-0.0067	0.874	45.10*	0.275
			(6.14)*	(8.83)*	(-0.516)			
M-Austr.	22	0.11	0.3049	0.5608	-0.0009	0.768	24.13*	0.335
			(4.93)*	(5.78)*	(-0.089)			
V-Austr.	22	0.01	0.2720	0.6270	-0.0061	0.716	18.67*	0.390
			(3.72)*	(5.45)*	(-0.70)			
M-Brazil	12	-0.60	0.4193	0.5019	-0.0071	0.819	17.57*	0.289
			(5.03)*	(4.28)*	(-0.38)			

TABLE 7 (continued)

Route	No.	Interc. (log.)	U (+)	S (+)	Q (-)	$\bar{R}^2$	F	S.e.
M-Ghana	17	-0.30	0.2539 (3.55)*	0.6842 (5.67)*	-0.4709 (-0.36)	0.835	27.92*	0.289
V-Japan	17	-0.92	0.3814 (6.20)*	0.6690 (7.45)*	-0.0152 (-1.65)	0.870	36.59*	0.297
V-India	20	0.09	0.2619 (4.66)*	0.6233 (7.34)*	-0.0028 (-0.38)	0.818	30.86*	0.289
M-S.Africa	20	0.92	0.4218 (4.61)*	0.4958 (3.40)*	-0.0136 (-1.12)	0.675	14.16*	0.490
V-S.Africa	20	-0.53	0.3600 (4.07)*	0.6357 (4.12)*	-0.0108 (-1.69)	0.702	15.90*	0.463
M-Trin.-To.	22	0.10	0.2597 (4.11)*	0.4276 (4.64)*	-0.0255 (-2.72)*	0.756	21.65*	0.304
M-Jam.	20	0.85	0.3992 (4.24)*	0.4596 (3.19)*	-0.0022 (-0.17)	0.650	12.78*	0.425
V-Jam.	18	-0.32	0.3087 (5.02)*	0.3190 (3.59)*	-0.0101 (-0.78)	0.721	15.63*	0.298
V-Peru,Ch.	19	1.01	0.3842 (4.94)*	0.4498 (3.90)*	-0.0077 (-0.68)	0.741	18.16*	0.379

Notes: 1. All figures within brackets refer to t-values

2. Key to abbreviations:

M	Montreal	Sw.	Sweden
V	Vancouver	No.	Norway
UK	United Kingdom	Sp.	Spain
F	France	It.	Italy
B	Belgium	Austr.	Australia
H	Holland	Trin-To.	Trinidad-Tobago
Ge.	Germany	Jam.	Jamaica
De.	Denmark	Ch.	Chile

U	Unit value ($ per 2000 lbs)
S	Stowage factor (cu.ft/2000 lbs.)
Q	Quantity shipped (2000 lbs.)
No.	Number of observations
R^{-2}	Corrected coefficient of determination
F	Value of the F-ratio
S.e.	Standard error of the estimate

* Significant at the 5 per cent level

concentrated their negotiating efforts on this route. As most of the commodities included in the sample (or their close substitutes) are also Scandinavian export commodities, it is possible that considerable rate reductions have been negotiated for the Montreal-Scandinavian route as well. Different handling charges in different ports could also explain the variation in $\bar{R}^2$.

All regression coefficients for the variables denoting stowage and unit value are significant at the 5 per cent level, while only one coefficient for quantity moved is significant. The significance of U (unit value) clearly shows that both the conferences and the independent operators are price discriminators. The values of the coefficients vary inside a relatively narrow range (0.2493-0.4218). The lowest values are found on the following routes: Montreal-Scandinavia, Montreal-Ghana, Vancouver-India, and Vancouver-Trinidad, Tobago. The low value for the Vancouver-India trade is most likely caused by the fact that the conference (the Pacific Coast-India, Pakistan, Ceylon, Burma Agreement) appears to be a very loose organization.[1] For example, no dual rate contracts are stipulated. This means that the shipper is not tied to the conference. If an independent operator enters the market, the shipper is perfectly free to employ its services. This will reduce the monopoly power of the conference and hence lead to a lower coefficient of the unit value variable.

The largest regression coefficients are those for Montreal-Brazil,

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[1]See Table 4, p. 43.

Montreal-South Africa, and Montreal-Jamaica. The reason for the large coefficients for the last two routes, which are served by independent operators, is likely to be a successful exploitation of a monopoly situation as no competitors are present. The result from the Montreal-Brazil route should be treated with caution, as the regression only contains twelve observations. Because of the omission of commodities included in the other regressions, it could bias the result in either direction. However, making allowance for this fact, if the variable still has a large regression coefficient, it could be attributed to the presence of the Argentine national flag line in the conference. As the same conference serves Argentine ports, and assuming that the bargaining power of the flag line is considerable, it could be expected that there is a downward pressure on rates and checks on the discriminatory power on Argentine export trades. In order to compensate for this, the conference may attempt to make up the possible losses from the outward journey by charging higher rates on the inward journey.[1]

As mentioned, the coefficient for the variable denoting quantity moved is only significant in one instance (Vancouver-Trinidad, Tobago). This coefficient indicates that a 100 per cent increase in quantity loaded would only lead to a reduction in the freight rate of 2.6 per cent. Most other coefficients (apart from those for Montreal-United Kingdom; Vancouver-Denmark; Montreal-Sweden, Norway; Montreal-Spain, Italy; Montreal-Trinidad, Tobago) have the right sign and are of

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[1]For a similar argument, see above, p. 73.

approximately the same size. It is interesting that the only conference which appears to pay attention to the quantity of cargo is a joint Canadian and United States conference (The Latin America-Pacific Coast Steamship Conference to the Caribbean). This possible difference between joint conferences and Canadian-based ones will be further investigated below. It can be tentatively concluded that quantity rebates are of minor importance in explaining the variation of freight rates within a given conference.

The coefficient for the stowage factor is significant in all regressions. It shows a larger variation than the unit value coefficient. A coefficient of 0.80 implies that if one commodity is double the size of another commodity, all factors being equal, the bulkier commodity will have a freight rate 80 per cent higher than the other commodity. On the Vancouver-Jamaica route, the same commodity would only be charged a 32 per cent higher freight rate.

Theoretically, the most attractive explanation of the large variation in the size of the coefficient is the degree of excess capacity on the route. The larger the excess capacity, the cheaper the space, i.e. the lower is the value of the regression coefficient. Unfortunately, no information on excess capacity was available, so the hypothesis could not be tested.

It can be argued with justification that as some of the calculated freight rates contain the stowage factor, it is not surprising that the coefficient of the stowage factor is significant.[1] The larger

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[1]If the original freight rate (F) is quoted per W/M (weight or measurement), and if the stowage factor of the commodity (S) is greater than 40, then the corrected freight rate per ton (F') is $F' = \frac{F.S}{40}$

the amount of conversions made, the larger should the coefficient of the stowage factor be. This hypothesis was tested by running a simple correlation between the number of conversions and the regression coefficient for the stowage factor. The simple correlation coefficient was 0.157, so the relation, if any, is very weak. Therefore, the use of the stowage factors in calculating some of the freight rates does not invalidate their use as an independent variable.[1]

Model 2. As explained previously, model 2 was designed to test the significance of some variables in explaining the variation of the freight rate of a given commodity over different routes. The tested variables were distance, quantity moved, number of outside competitors, and whether the carrier was an independent operator or not. A log-linear, as opposed to a linear, relation proved to be the best choice. The results from twenty-five regressions are presented in Table 8.[2]

The coefficients of determination and the F-values are all relatively low. This is not surprising in view of the number of variables that should have been included, had it not been for lack of data. The F-values are not significant for seven out of twenty-five commodities,

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[1]An additional check on the results was made by running the same set of regressions using freight rates calculated per cubic foot instead of per 2000 lbs. The coefficients for unit value and quantity moved were almost identical. The coefficients for the stowage factor were negative, as expected, and corresponded in size to the results from the previous regressions. (All stowage coefficients in the first set of regressions were smaller than one. This implies that a 100 per cent increase in bulk leads to a less than 100 per cent increase in the freight rate per ton. Therefore the rate per cubic foot decreases and the new coefficient for the stowage factor must be negative).

[2]Aircraft assembly equipment and card punching machinery are not included in these regressions, as their freight rates are estimated from the general cargo rate.

TABLE 8

RESULTS FROM LOG-LINEAR REGRESSIONS ON MODEL 2

Commodity	No.	Interc. (log.)	A (+)	O (-)	D (+)	N (-)	$\bar{R}^2$	F	S.e.
Frozen salmon	27	2.91	0.2324 (2.42)*	-0.0271 (-3.59)*	0.278 (1.61)	-0.0064 (-0.20)	0.450	6.31*	0.314
Canned salmon	29	1.31	0.3344 (3.47)*	0.0030 (0.60)	-0.3350 (-3.19)	-0.0554 (-2.71)*	0.698	17.17*	0.179
Whiskey	31	1.97	0.3033 (3.43)*	-0.0082 (-1.76)*	0.134 (1.33)	-0.530 (-2.88)*	0.679	16.71*	0.185
Wheat flour	29	3.10	0.0620 (0.49)	-0.0037 (-0.69)	-0.073 (-0.51)	-0.092 (-3.45)*	0.383	5.34*	0.259
Unmanuf. Tob.	28	0.98	0.3401 (3.68)*	-0.0067 (-1.38)	-0.179 (-1.51)	0.011 (0.51)	0.399	5.48*	0.204
Douglas Fir	27	1.93	0.2428 (2.35)*	-0.0051 (-0.98)	-0.2154 (-1.77)	0.0024 (0.18)	0.265	3.34*	0.216
Hemlock	28	4.18	-0.0118 (-0.08)	-0.0026 0.40)	-0.191 (-1.03)	-0.045 (-1.35)	-	0.93	0.290
Plywood	26	2.36	0.1355 (1.38)	-0.0029 (-0.06)	0.011 (0.09)	-0.0013 (-0.06)	-	0.80	0.215
Woodpulp	30	0.47	0.378 (3.36)*	-0.0028 (-0.63)	-0.1460 (-1.06)	-0.046 (-1.66)	0.487	7.89*	0.251
Newsprint	30	5.03	0.071 (0.89)	-0.0061 (-1.43)	0.017 (0.19)	-0.0069 (-0.42)	0.152	2.29*	0.158
Resins	19	1.93	0.214 (1.50)	-0.0303 (-4.30)*	0.135 (0.98)	-0.021 (-0.81)	0.673	10.27*	0.242
Steel bars	30	4.45	-0.1000 (-1.46)	-0.0052 (-1.17)	0.124 (1.31)	-0.080 (-4.14)*	0.534	9.25*	0.161
Sheet & Strip	25	2.95	0.056 (0.57)	-0.072 (-1.43)	-0.135 (-1.17)	-0.028 (-1.30)	0.270	3.23*	0.200
Aluminum	30	4.64	-0.1501 (-0.86)	-0.0198 (-2.47)*	0.1886 (0.75)	-0.0111 (-0.26)	-	1.70	0.397
Copper	20	4.97	-0.1695 (-0.77)	-0.044 (-4.55)*	0.5669 (2.65)*	-0.017 (-0.48)	0.599	8.08*	0.332
Copper tubing	26	4.08	0.012 (0.12)	-0.0026 (-0.49)	0.290 (2.70)*	-0.013 (-0.64)	0.158	2.17	0.192
Nickel	29	5.37	-0.1804 (-1.80)	0.0006 (0.13)	0.4827 (4.01)*	-0.088 (-4.03)*	0.554	9.68*	0.211

TABLE 8 (continued)

Commodity	No.	Interc. (log.)	A (+)	Q (-)	D (+)	N (-)	$\bar{R}^2$	F	S.e.
Nuts & Bolts	21	3.17	0.052 (0.56)	-0.0084 (-1.65)	0.059 (0.62)	0.0200 (1.09)	-	0.86	0.167
Wire & Cable	20	3.37	0.1085 (0.86)	-0.0051 (-0.78)	0.018 (0.13)	-0.0014 (-0.01)	-	0.64	0.213
Passenger auto.	30	1.62	0.477* (3.88)*	-0.011 (-1.39)	0.076 (0.48)	-0.017 (-0.58)	0.458	7.12*	0.274
Aircraft engines	28	4.78	0.0404 (0.59)	-0.001 (-0.24)	-0.108 (-1.27)	-0.037 (-3.28)*	0.372	5.00*	0.372
Construct-ion mach.	32	-0.56	0.098 (0.82)	0.0038 (0.60)	0.0049 (0.001)	-0.055 (-2.16)*	0.111	2.02	0.245
Agricult-ural mach.	30	-2.02	0.2574 (3.36)*	-0.0054 (-1.42)	0.2069 (2.95)*	-0.027 (-1.89)*	0.670	15.54*	0.140
Telephone appliances	30	1.25	0.300 (1.81)*	-0.0056 (-0.68)	0.500 (2.77)*	-0.017 (-0.50)	0.306	4.18*	0.334
General cargo	29	-0.22	0.1188 (1.58)	-0.0034 (-0.63)	-0.0064 (-0.07)	-0.012 (0.72)	0.110	1.87	0.162

Notes: 1. The freight rates for construction machinery, agricultural machinery and general cargo are expressed per cubic foot, not per 2000 lbs.

2. Abbreviations:

No. number of observations
A distance in nautical miles
Q quantity shipped. The regressions for agricultural machinery and construction machinery contain values instead of quantities
D dummy variable. D = 0 if the commodity is carried by a conference, D = 1 if it is carried by an independent operator
N number of competitors on the route
R^{-2} corrected coefficient of determination
F value of the F-ratio
S.e. standard error of the estimate

* significant at the 5 per cent level

indicating that there is no statistical relationship between the postulated variables.[1]

The distance variable is significant at the 5 per cent level in nine out of twenty-five cases. The highest coefficient is that for passenger automobiles, which indicates that a 100 per cent increase in distance causes a 48 per cent increase in freight rates. Negative coefficients are found for hemlock, steel bars, aluminum, copper and nickel. The negative coefficients lend some support to the claim by the Federal Maritime Commission that the conferences in some instances try to compensate shippers for the disadvantages of large distances by charging lower freight rates.[2]

The results in the table seem to indicate that the freight rates of commodities with large stowage factors are more sensitive to changes in distance than the freight rates of commodities with low stowage factors. For example, automobiles, whiskey, canned salmon, and frozen salmon, all with significant distance coefficients, have larger stowage factors than copper, aluminum, steel bars, and nickel, all of which display negative coefficients.[3] In order to provide more definite evidence, stowage factors were correlated with the distance coefficients. The correlation coefficient was 0.75 (t=22.50). It can therefore be

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[1]The low F-values for plywood and newsprint could be partly attributed to possible inaccuracies in the freight rates introduced by the standardization procedures (See above, p. 80).

[2]<u>Fact Finding Investigation</u>, p. 129.

[3]For stowage factors, see Table 16, Appendix.

concluded that there is a positive relation between the stowage factor of a commodity and the response of its freight rate to changes in distance. As the results of model 1 indicate that stowage is an extremely important factor in determining freight rates, it is reasonable to expect that bulky commodities will be penalized if they are shipped over large distances.

The variable for quantity shipped is significant at the 5 per cent level in five instances (frozen salmon, resins, aluminum, copper, and whiskey). Only three of the coefficients have the wrong sign (canned salmon, nickel, construction machinery). The coefficients are of approximately the same size as in model 1, the significant ones varying between -0.0303 and -0.0082. The freight market for aluminum and copper is subject to tramp competition which agrees with the observed significance of the coefficients. For frozen salmon, it can be hypothesized that if sufficient quantities of frozen goods are shipped, better facilities for handling these goods may be installed, which could lead to lower carrying costs and therefore to lower freight rates.

Copper, copper tubing, nickel, agricultural machinery, and telephone apparatus, all of relatively high value, display significant coefficients for the dummy variable. This could indicate that the independent operator exploits its monopoly situation by discriminating to a larger degree than the conferences against high-valued commodities. Of the remaining coefficients 11 are positive and nine are negative. Therefore the explanatory power of the dummy variable is weak and will be further investigated below.

The existence of competitors on a given route appears to have

some effect on freight making behaviour. *A priori* it would limit the power of the conferences to charge monopoly prices. The variable N_j is significant at the 5 per cent level for eight commodities. The coefficient has the wrong sign for three commodities. The significant coefficients vary between -0.530 for whiskey and -0.027 for agricultural machinery. Whiskey is usually regarded as a desirable liner commodity as it is relatively high valued and comes in relatively large quantities. If the number of competitors on a route doubled, the conference would have to lower its rate on whiskey by 53 per cent. Therefore the available evidence indicates that the conferences tend to exploit their monopoly power if no competitors are present.

The intercept term is always positive except for those commodities where the freight rate was calculated per cubic foot instead of per short ton (construction machinery, general cargo and agricultural machinery).

A Final Regression Using All Variables and All Observations. The next stage in the analysis was to pool all observations into one large regression containing all previously included variables. The results from the regression are presented in Table 9.

These results support the previous conclusions. The only variable that does not contribute significantly to the explanation of the dependent variable is the dummy variable for conference membership. With the exception of the coefficient for the variable N_j (number of outside competitors), all the remaining coefficients are of approximately the same magnitude as in the previous regressions. A 100 per cent increase in distance will lead to an increase in freight rates

TABLE 9

RESULTS FROM FINAL REGRESSION: USING MODELS 1 AND 2

Variable	Coefficient	t
Distance	0.2323	6.65*
Unit Value	0.3405	24.71*
Number of Outside Competitors	-0.0095	-2.71*
Stowage	0.5862	27.20*
Quantity Moved	-0.0078	-3.82*
Dummy Variable for Conference Membership	0.0066	0.98
Intercept (log)	-2.5204	
$\bar{R}^2$	0.774	
F	291.22*	
Standard Error of Estimate	0.372	
Number of Observations	534	

Notes: * significant at the 5 per cent level

of 23 per cent, a 100 per cent increase in value will increase freight rates by 34 per cent, and a 100 per cent increase in stowage by 58 per cent. A similar increase in quantity shipped will decrease the freight rate by only .78 per cent, and an increase in the number of outside competitors by .95 per cent.

This regression was performed under the assumption that all conferences and independent operators exhibit the same rate making behaviour. The validity of this assumption could perhaps be questioned. It seems likely that the stringent United States regulations of shipping conferences would have had some effect on their rate-making process, and in that way affect joint Canadian and United States conferences. The hypothesis that Canadian based conferences and independent operators do not behave differently from joint conferences was tested by a simple dummy variable technique, developed by Damodar Gujarati.[1] It has the advantage over the Chow test in that it can test whether certain aspects of behaviour are different, i.e. it can test for differences between individual coefficients instead of, as the Chow test, whether the whole relation comes from two different structures.[2]

The data are divided into two groups. The first group contains data relating to Canadian operators, the second group those relating to joint operators. The dummy variable for conference membership is dropped.

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[1]Damodar Gujarati, "Use of Dummy Variables in Testing for Equality between Sets of Coefficients in Linear Regressions. A Generalization." City University of New York, Mimeographed paper.

[2]For explanation of the Chow test, see J. Johnston, Econometric Methods (New York: McGraw-Hill, 1961), pp. 136-138.

$$F_{ij}^1 = b_1 + b_{11}A_j^1 + b_{12}U_i^1 + b_{13}N_j^1 + b_{14}S_i^1 + b_{15}Q_{ij}^1 + u_{ij}$$
$$F_{ij}^2 = b_2 + b_{21}A_j^2 + b_{22}U_i^2 + b_{23}N_j^2 + b_{24}S_i^2 + b_{25}Q_{ij}^2 + u_{ij} \qquad (1)$$

where F_{ij} = freight rate of commodity i on route j
A_j = distance between the Canadian and the foreign port on route j
U_i = unit value of commodity i
N_j = number of competitors on route j
S_i = stowage factor of commodity i
Q_{ij} = quantity shipped of commodity i on route j

The hypothesis is that there is no difference between b_1 and b_2, between b_{11} and b_{21}, between b_{12} and b_{22} and so on. In order to test this hypothesis the two equations are combined into one:

$$F_{ij} = a_o + a_1 D + a_2 A_j^1 + a_3 DA_j^2 + a_4 U_i^1 + a_5 DU_i^2 + a_6 N_j^1 + a_7 DN_j^2 + a_8 S_i^1 + a_9 DS_i^2 + a_{10} Q_{ij}^1 + a_{11} DQ_{ij}^2 + u_{ij} \qquad (2)$$

D = Dummy variable. D = 1 if the freight rate is set by a Canadian operator; D = 0 if the freight rate is set by a joint operator
a_0 = intercept for group 2 (joint operators)
a_1 = differential intercept for group 1
a_2 = slope coefficient for A_i (group 2)
a_3 = differential slope coefficient for A_j (group 1)
a_4 = slope coefficient for U_i (group 2)
a_5 = differential slope coefficient for U_i (group 1)
a_6 = slope coefficient for N_i (group 2)
a_7 = differential slope coefficient for N_j (group 1)
a_8 = slope coefficient for S_i (group 2)
a_9 = differential slope coefficient for S_i (group 1)
a_{10} = slope coefficient for Q_{ij} (group 2)
a_{11} = differential slope coefficient for A_{ij} (group 1)

Then the coefficients of the second equation of (1) corresponds directly to the slope coefficients of (2). That is $b_2 = a_0$, $b_{21} = a_2$, $b_{23} = a_4$ and so on. In order to obtain the coefficients of the first equation of (1), the slope coefficients and the differential slope coefficients have to be added. That is, $b_1 = a_0 + a_1$, $b_{11} = a_2 + a_3$, $b_{12} = a_4 + a_5$ and so on.

Equation (2) was estimated by ordinary least squares. The results are given in Table 10. The only differential slope coefficient that is not significant at the 5 per cent level is the coefficient for unit value. This means that Canadian and joint operators practice price discrimination to the same degree, but all other modes of freight- making behaviour are different.

It is possible that the differences between the two groups in their reaction to changes in distance is caused by differences in fuel costs. If the joint operators have lower fuel costs per nautical mile, large distances will be of less significance for them than for the Canadian operators in terms of costs.[1] Presumably comparative fuel costs depend on three factors: proximity to the major oil sources (the Persian Gulf, Venezuela), proximity to refineries, and local fuel taxes. Unfortunately, the data are not available to test the hypothesis.

The equality of the unit value coefficients indicates that the monopoly power of the Canadian and the joint conferences is equal. This seems paradoxical in view of the stringent United States regulations of the joint conferences. However, the Federal Maritime Commission does not interfere with discriminatory pricing, provided it is not "unfair or unjustly discriminatory." Further, lack of legislation in Canada against barriers to entry does not necessarily mean that the monopoly

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[1]The joint conferences cover routes between the Pacific coast and Japan, India, Australia, Peru, Chile, the Caribbean; and between Northeastern North America and west Africa, and eastern South America. The Canadian conferences cover routes between Montreal and Europe, Australia, South Africa; and between Vancouver and Europe, South Africa.

TABLE 10

RESULTS FROM FINAL REGRESSION ON MODELS 1 AND 2, USING DUMMY VARIABLE TECHNIQUE

Variable	Canadian Operators	Joint Operators	Slope Coefficient
Distance	0.263 (7.18)*	-0.062 (-0.66)	0.349 (3.32)*
Unit Value	0.339 (20.96)*	0.326 (13.99)*	0.013 (0.44)
Number of Competitors	-0.0113 (-3.08)*	0.002 (0.336)	-0.014 (-1.73)*
Stowage	0.618 (24.48)*	0.530 (14.59)*	0.083 (1.87)*
Quantity	-0.002 (-0.68)	-0.014 (-4.09)*	0.012 (2.93)*
Intercept	-2.947	0.572	-9.838 (-3.81)*
$\bar{R}^2$	0.789	0.767	0.788
F	271.86*	106.22*	176.58*
Standard Error of Estimates	0.358	0.355	0.357
Number of Observations	367	167	534

Notes: 1. Two separate regressions, one covering Canadian operators and the other covering joint operators, were performed in addition to the overall regression using the dummy variable technique. This is the reason why $\bar{R}^2$, F, and standard error of estimate appear for the Canadian operators and the joint operators. For an explanation of the dummy variable technique, see text.

2. D = 0 for joint conference
D = 1 for Canadian operator

* significant at the 5 per cent level

power of the Canadian conference is more substantial, as there are usually independent operators or tramps that serve as a competitive check on the conferences.

The presence of outside competitors have apparently more effect on the Canadian conferences than on the joint conferences. This is consistent with the free entry clause of the United States laws. If there are no barriers to entry, the number and significance of outside competitors is presumably greatly reduced.

The differences in the coefficients for stowage could imply that there is slightly more excess capacity on the joint routes. This again is plausible in view of the free entry clause of United States law.

The differential coefficient for quantity moved confirms what was indicated from the first set of regressions: that joint operators are more likely to give lower freight rates for commodities that move in large quantities than are Canadian operators. As one of the main reasons for giving quantity discounts is to compete with tramps, the obvious conclusion is that the difference is caused by tramp competition. The question to be answered is whether or not tramps are a more serious competitive threat to joint conferences than to Canadian conferences. As the joint conferences serve both Canada and the United States, the volume of cargo is likely to be large, which would tend to encourage tramp competition. However, an unambiguous answer to this question would require considerable research into tramp loadings to the various countries involved, which is beyond the scope of this dissertation.

The large, significant difference in intercept terms indicates that the general level of rates of the joint operators is higher than

that of Canadian operators. Three possible explanations can be offered: (1) The trade routes covered by the joint conferences are generally routes connecting Canada with underdeveloped countries.[1] It is possible that the probable lack of general cargo on the inbound route (the Canadian import route), necessitates a relatively high level of rates on the outbound route in order for the conference to be able to cover fixed costs. (2) The members of the joint conferences are lines with generally higher fixed costs. (3) Calling at a Canadian port constitutes a detour from the normal shipping route, and therefore higher costs. These higher costs are not compensated for by a substantial amount of cargo. Explanations (1) and (3) are equally plausible. No judgement can be passed on the second explanation, as no comparative cost data are available.

Conclusion

The results from the models confirm that all conferences and independent shipping lines examined are price discriminators in the sense that rates vary with unit value. Stowage is an extremely important factor in the rate-making process. Quantity discounts are generally insignificant, and the influence of distance is smaller than is usually expected. There appears to be some relationship between a high coefficient for the distance variable and a high stowage factor. The number of outside competitors have a small but significant impact on rate-making. There are statistically significant differences between joint conferences and Canadian operators in their response to variations in distance, stowage, quantity discounts, and the number of independent competitors.

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[1] See footnote, p. 98.

CHAPTER 4

EMPIRICAL EVIDENCE ON THE INFLUENCE OF TRANSPORT COSTS ON INTERNATIONAL TRADE FLOWS

In view of the general neglect of transport costs in trade theory, it is not surprising that this neglect is apparent in empirical work as well. Another explanation why few studies on transportation and trade are available is the data problem. In the first place, the amount of transport data which are usually required, often makes the undertaking impossible. Secondly, shipping conferences as well as trucking firms tend to be secretive about their rates. A third explanation is the complicating feature introduced by the influence of transport costs on the location of industry.

This essay begins with a review of the few existing studies on transport costs and the structure of trade.[1] These can be divided into two groups: (1) the studies which relate distance to trade flows, (2) those which study transport costs and their effect on trade. The review will be followed by the development and test of a cross-section model,

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[1]The emphasis is on the effect on the structure of trade. By the structure of trade is meant the distribution of imports and exports over products and over countries. Topics, such as the effective protection of transport costs, are not discussed here. The interested reader is referred to H.G. Johnson, "The Theory of Effective Protection and Preferences," Economica, XXXVI (May, 1969), pp. 119-138; and W.G. Waters II, "Transport Costs, Tariffs, and the Pattern of Industrial Protection," American Economic Review, LX (Dec., 1970), pp. 1013-1020.

designed to quantify the effect of variations in transport costs on the demand for Canadian exports of selected commodities to selected countries.

Studies of Distance and Trade

One of the earliest attempts to explain aggregate trade flows was made by Beckerman, in 1956.[1] He treated distance as a proxy variable for transport costs. His hypothesis was that a country's exports and imports are concentrated on the nearest countries. The data used were export and import statistics of the main OECD countries for three years: 1938, 1948, and 1953. These were adjusted to eliminate differences caused by the absolute sizes of the exports and imports of each country, as only the relative distribution of exports and imports between countries is of importance. The resulting figures pointed to a striking degree of concentration of each country's trade; a concentration that was to a large extent directed to the nearest countries. The tendency to concentration was not as strong if the three nearest countries were considered rather than the two nearest.

In order to obtain some definite evidence on the influence of distance, Beckerman introduced the concept of economic distance which "relates to the cost of transversing distance rather than the mileage involved."[2] The working hypothesis was then that economic distance is reflected in the difference in the unit value between f.o.b. export data and c.i.f. import data. For each country, the export and import

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[1] W. Beckerman, "Distance and the Pattern of Intra-European Trade," Review of Economics and Statistics, XXXVIII (Feb., 1956), pp. 31-40.

[2] Ibid., p. 32.

markets were ranked according to economic distance. This ranking was then correlated with another ranking, based on the size of the different export and import markets. The average Spearman rank correlation coefficient was .63 for imports and .59 for exports, which gives tentative support to the hypothesis that economic distance affects trade flows.

There are some inconsistencies in Beckerman's analysis. As an illustration of the concept of economic distances, a table is presented showing the percentage differences between f.o.b. export and c.i.f. import data for Swedish trade in paper and paperboard with twelve countries:[1]

Country	% Markup
Denmark	− 1
Belgium	+ 1
Norway	+ 5
Holland	+ 6
Germany	+ 6
Ireland	+ 8
United Kingdom	+ 9
France	+10
Italy	+12
Portugal	+14
Turkey	+23
Greece	+28

> If one is attempting only to order the countries one can probably improve the above ranking by, say, transposing Greece and Turkey (Turkey should be further away from Sweden than is Greece) or Norway and Belgium, and so on. On the basis of evidence for other products and including any adjustments that seem to be reasonably certain, the countries were ordered as shown in Table ....[2]

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[1] Beckerman, p. 35.

[2] *Ibid.*

So Beckerman suddenly abandons his idea of economic distance and refers to physical distance. The whole exercise of taking unit values and comparing f.o.b. and c.i.f. data seems rather futile, if the ranking is later to be changed to reflect physical distance.[1]

Tinbergen and Pöyhönen hypothesized that the volume of trade between two countries is determined by the national income of each country and the distance between them.[2] The income of the importing country is a variable denoting potential demand and the income of the exporting country denotes potential supply.

Pöyhönen postulated the following relation:

$$a_{ij} = cc_i c_j \frac{e_{ii}^{a} \, e_{jj}^{b}}{1 + vr_{ij}^{d}}$$

a_{ij} = estimate of the value of exports from country i to j
e_{ii} = national income in the country of export i
e_{jj} = national income in the country of import j
r_{ij} = distance of transportation
a,b = national income elasticities of exports and imports
v = transport cost coefficient per nautical mile
d = isolation parameter
c_i = export parameter of country i
c_j = import parameter of country j

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[1]It is fairly obvious from his analysis that when he refers to economic distance, he means transport costs. Towards the end of his article he introduces psychic distance (p. 40) meaning all other effects apart from transport costs which are caused by distance. Such effects are on the supply side lack of knowledge of distant markets; longer delivery times, which necessitates larger stocks. On the demand side the demonstration effect is important [see C.P. Kindleberger, Foreign Trade and the National Economy (New Haven: Yale University Press, 1962), pp. 15-20.]

[2]Jan Tinbergen, Shaping the World Economy: Suggestions for an International Economic Policy (New York: The Twentieth Century Fund, 1962); Pentti Pöyhönen, "A Tentative Model for the Volume of Trade Between Countries," Weltwirtschaftliches Archiv, XV (1963), pp. 93-99.

Aggregate export and import data were used for ten European countries. The following results were obtained by a least squares method:

$a = .518$
$b = .504$
$v = .00157$
$d = 1.817$
$\ln c = -3.818$

Country	c_i	c_j
Belgium	0.109	-0.145
Denmark	-0.199	-0.081
Finland	-0.481	-0.580
Germany	0.624	0.200
Italy	0.583	0.838
Netherlands	0.434	0.061
Norway	-0.315	0.002
Portugal	-1.106	-0.402
Sweden	0.302	0.062
United Kingdom	-0.024	0.071

Unfortunately, Pöyhönen does not discuss the rationale of his parameters. He mentions that the low value of v reflects the relationship between the cost of loading and that of transportation, which is reasonable. Then he points out that the parameter d turned out smaller than the expected value 2.[1] D presumably represents a gravitational parameter which usually has the value 2 in the theory of physics. Why this value would also hold for economic relations is not explained.

Tinbergen proposed a similar model:

$$E_{ij} = a_0 Y_i^{a_1} Y_j^{a_2} D_{ij}^{-a_3} N^{a_4} P_c^{a_5} P_b^{a_6}$$

E_{ij} = exports from country i to country j
Y_i = GNP of exporting country
Y_j = GNP of importing country
D_{ij} = Distance between i and j
N = dummy variable for neighbouring countries
P_c = dummy variable for Commonwealth preference
P_b = dummy variable for Benelux preference

The following results were obtained by ordinary least squares (the figures in brackets refer to the standard errors):

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[1]Pöyhönen, p. 98.

$$
\begin{aligned}
a_0 &= -.4551 \\
a_1 &= .7357\ (.0421) \\
a_2 &= .6183\ (.0422) \\
a_3 &= -.5570\ (.0473) \\
a_4 &= .0191\ (.0082) \\
a_5 &= .0491\ (.0011) \\
a_6 &= .0406\ (.0273)
\end{aligned}
$$

Adding the last three variables only increased R from .8248 to .8437. Of the dummy variables only the one for Commonwealth preference was significant. Y_i, Y_j, and D_{ij} were all highly significant.

Linneman's research was an extension of Tinbergen's study. It constitutes the most successful attempt, so far, in quantifying the determinants of the trade flows between all non-communist countries. His model is again a log-linear model and can be written:

$$X_{ij} = b_1 Y_i^{b_2} N_i^{-b_3} Y_j^{b_4} N_j^{-b_5} D_{ij}^{-b_6} P_{ij}^{b_7}$$

X_{ij} = exports of country i to country j
Y_i = GNP of exporting country
N_i = population of exporting country
Y_j = GNP of importing country
N_j = population of importing country
D_{ij} = geographic distance between i and j
P_{ij} = preferential trade factor

Y_i and N_i are factors indicating total potential supply, Y_j and N_j indicate total potential demand. As is apparent, the basic difference between his and Tinbergen's model is the inclusion of the variables N_i and N_j. There are two reasons for including population size as a variable. Firstly, large countries are more likely to be self-sufficient. Secondly, large countries are likely to develop economies of scale, and therefore comparative advantage in a large variety of products.[1]

Linneman gave considerable attention to the justification of

[1]Linneman, pp. 8-25.

the different variables in the model. In this context, his discussion of the variables P_{ij} and D_{ij} deserves some comment.

The main trade resistance factors according to Linneman are natural and artificial obstacles to trade. The artificial obstacles are tariff barriers and quotas. As he was working with aggregate data, he could not incorporate customs data - the difficulties in constructing a "customs index" for each country are considerable, if not insurmountable. Linneman therefore assumed that the basic resistance is equal between all countries and introduced instead dummy variables for preferential trade relations.

D_{ij} is a proxy variable for natural trade impediments. Again, because the analysis is on an aggregate level, it is just as difficult to integrate transport costs *per se* as customs data. He also justified the use of distance instead of transport costs by speculating that transport costs may not be the most important natural trade impediment.[1] He supported this speculation by some results from Karreman's research on the technical aspects of constructing a world transportation account.[2] Karreman found that aggregate freight factors (freight factor = $\frac{\text{transport}}{\text{c.i.f.}}$ $\frac{\text{costs} \quad 100}{\text{unit value}}$) vary between 3.2 for Mexico and 12 for Spain, Jordan and Taiwan.[3]

> ...still one cannot help feeling that these magnitudes (for instance in comparison to prevailing profit margins)

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[1] *Ibid.*, p. 26.

[2] Herman F. Karreman, *Methods for Improving World Transportation Accounts, Applied to 1950-1953*, Technical Paper 15 (New York: NBER,1961).

[3] *Ibid.*, p. 21

> are in a sense too small to justify the emphasis on transportation costs as the major natural obstacle to trade.[1]

Linneman maintained that dynamic factors such as the time element in transportation and what Beckerman called psychic distance are comparable to the importance of transport costs.

The time element is clearly important. The longer the time spent in transit, the larger the stocks required and the greater the risk of losing profit opportunities. With regard to psychic distance, it is fairly obvious that proximity to the market leads to better information on business conditions, laws, institutions, habits, language, etc. On the demand side, proximity to markets is likely to lead to various imitations in consumption patterns (the demonstration effect). The use of physical distance as a proxy for all these factors is probably adequate in most instances, except when there are major natural obstacles, such as the Andes. The physical distance between Brazil and Peru may give rather a faulty impression of both economic and psychic distance.

One gets the impression that Linneman discarded the importance of transport costs too lightly, particularly in the absence of any empirical evidence. Freight factors, individual or aggregate, do not give any conclusive evidence of the importance of transport costs in determining trade flows, unless they are accompanied by supply and demand elasticities.[2] Karreman's study was only concerned with the estimation of the transportation account for balance of payments purposes, not

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[1]Linneman, p. 26.

[2]For further discussion of this point, see below, p. 113.

with the effect of transport costs on trade.

Linneman performed twenty-eight regressions on the included variables using various combinations of variables, and conditional and unconditional regressions. The estimates of the coefficients for the distance variable varied between -0.74 and -1.52 (standard errors varied between 0.03 and 0.04). The coefficients for all other variables were also significant. The multiple correlation coefficient varied around 0.8. After having calculated beta-coefficients, he could conclude that the greatest contributions to the explanation of the variation in trade flow sizes were made by the two GNP variables and the distance variable.[1] An index of the distance effect was also constructed. A high value of the index would indicate a good export location, a low value an unfavourable location. At one end of the scale were the Netherlands and Belgium, at the other end, Japan, Australia, and New Zealand. The effort in realizing a certain increase in foreign trade was estimated at six times greater for the latter countries.

The latest in a long series of cross-section studies on the determinants of trade flows is one by Vernon and Gruber.[2] This is different in that it is a study at a disaggregate level, involving twenty-four industries. The model is:

$$E_{ij} = b_0 PC_i^{-b_1} \; PC_j^{-b_2} \; GNP_i^{b_3} \; GNP_j^{b_4} \; D_{ij}^{-b_5} \; P_{ij}^{b_6} \; / \Delta PC_{ij}^{+b_7} / \; / \Delta H_{ij}^{b_8} /$$

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[1] Linneman, p.88.

[2] William H. Gruber and Raymond Vernon, "The Technology Factor in a World Trade Matrix," in The Technology Factor in International Trade, pp. 233-272.

E_{ij} = estimate of exports of country i to country j
PC_i = Per capita income of exporting country i
PC_j = Per capita income of importing country j
GNP_i = gross national product of exporting country i
GNP_j = gross national product of importing country j
D_{ij} = a functinn of distance between i and j
P_{ij} = dummy variable for preferential trade arrangement between i and j
$/\Delta\ PC_{ij}/$ = absolute difference between PC_i and PC_j
$/\Delta\ H_{ij}\ /$ = absolute difference in difference between index of human resource development in the exporting area H_i and that in the importing area H_j

Unfortunately, the authors do not discuss the rationale of the first six variables, since "they are fairly familiar in this sort of analysis."[1] For example, it is not clear what GNP is meant to test. They infer that a significant positive coefficient for GNP_i stresses the internal and external economies of large countries as a source of export strength in manufactured products.[2] This interpretation is certainly different from that of Linneman, who uses population as a proxy variable for economies of scale.

The use of the distance variable at a disaggregated level would also have deserved some discussion. Midpoints of regions were used as terminal points. No mention is made whether this refers to the economic centre of the country, or the region in which each commodity is produced or consumed.[3] This distinction is important when individual commodities are analysed.

In their study, land distances were weighted by a factor of

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[1] Ibid., p. 256.

[2] Ibid., p. 261.

[3] Ibid., p. 271. Linneman used the economic centre of the country.

two. No justification is given for this procedure. It is not clear what the distance variable is intended to test. If the coefficient of the variable is meant to indicate the influence of transport costs, they might be justified in multiplying land distances by a factor of two, as it is generally believed that land transport costs are higher than ocean transport costs. If on the other hand, their intention is to test for the influence of distance, distance meaning both economic and psychic distance, it is certainly debatable whether land distances should be weighted at all. The coefficient for the distance variable turned out to be significant in most cases and varied between -.3 and -1.4.

The last two variables were introduced to test the influence of differences in consumption patterns and human resources development, the hypothesis being the larger the differences, the larger the trade flows. The coefficients usually had the right signs but were significant in very few cases.

All the studies that have just been reviewed relate distance to trade. As the existence of distance implies the existence of transport costs, it could be argued that they also relate transport costs to trade. However, it was demonstrated in Chapter 3 that larger distances do not necessarily imply higher transport costs. Further, for policy purposes, it is not very enlightening to know that exports and imports are sensitive to changes in distance. Gruber and Vernon inform us that the exports of ferrous metals are more sensitive to changes in distance than those of lumber and wood. This information is of little use unless we know whether the difference is caused by psychological factors or transport costs or both, i.e. whether the exporters should

concentrate on obtaining transport rebates or increasing their marketing efforts.

Studies of Transport Costs and Trade

As the emphasis in this thesis is on the effect of transport costs on individual trade flows, i.e. the structure of trade, no mention need to be made of the many studies that have made passing reference to the upsurge in trade that follows major innovations in transportation.[1] Only two relevant studies were found: Munro's for Canada and Sarangan's for India.[2] Both make extensive use of freight factors. The term freight factor, its use and misuse, would therefore merit some discussion.

A freight factor is the percentage proportion of transport costs in the final price (occasionally the f.o.b. price). Freight factors were introduced by Karreman and Moneta primarily as an aid in estimating the transportation account in the balance of payments.[3] According to the rules of the International Monetary Fund, exports and imports should be reported f.o.b. and transport costs should be reported on a separate transportation account. As is well known, imports are usu-

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[1]See for example David W. Slater, World Trade and Economic Growth: Trends and Prospects with Applications to Canada (Toronto: PPAC and University of Toronto Press, 1968), p. 35.

[2]John M. Munro, Trade Liberalization and Transportation in International Trade (Toronto:PPAC and University of Toronto Press, 1969); UNCTAD, T.D. Sarangan, Liner Shipping in India's Overseas Trade, TD/B/C.4/31.

[3]Karreman, Methods for Improving World Transportation Accounts; Carmellah Moneta, "The Estimation of Transportation Costs in International Trade," Journal of Political Economy, LXVII (Feb., 1959), pp. 41-58.

ally valued c.i.f. Freight factors can therefore be used in estimating the freight costs, and in converting imports to f.o.b. valuation.[1]

Subsequently freight factors have been used as an indication of the effect of transport costs on the movement on certain commodities. This is not legitimate, as a freight factor gives no information on the relevant elasticities. For example, a low freight factor combined with large demand and supply elasticities for the export product could have the same effect on trade flows as a high freight factor combined with low demand and supply elasticities.

Munro's book constitutes an ambitious attempt to analyse the effect of various transport policies on commodity trade between the United States and Canada.[2] The general conclusion is that because of various restrictive policies, trade between the United States and Canada is smaller than it could have been. No quantitative estimates are given, the reason being lack of data.

The restrictive transport policies have caused higher railway rates on international routes. Regulations in trucking makes reloading necessary at border points, which also leads to higher freight costs. Shipping on the Great Lakes is restricted to Canadian and United States carriers. As these are carriers with comparatively high costs it is

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[1]It is questionable if freight factors are particularly useful for balance of payments purposes, unless they are adjusted each year. A study by UNCTAD shows that freight factors for the same commodity and the same destination vary considerably over time. (UNCTAD, The Level and Structure of Freight Rates, TD/B/C.4/38, pp. 33-34.

[2]Munro, Trade Liberalization and Transportation in International Trade.

inferred that the freight rates are higher than they would be under more competitive conditions. Unfortunately, many of Munro's conclusions about the effects of various discriminatory rates rests on the assumption that freight factors give a good indication of the damage done to various Canadian exports. On the one hand he writes:

> For given elasticities of supply and demand, the higher the level of transport costs in relation to delivered price, the greater the influence of transportation in determining trade patterns.[1]

The recognition of the importance of elasticities is later abandoned:

> Although the freight factors derived from this ICC information should not be used as absolute figures, the relative ranking of different commodities by freight factors is of some interest and will indicate the general response of trade in these commodities to changes in transport costs.[2]

The commodities are lumber, wood-pulp, newsprint, fertilizers, iron and steel, aluminum, nickel, and agricultural machinery. He must therefore assume that the demand and supply elasticities are equal for all these, which is hardly realistic. The results from the analysis below show quite clearly that the commodities with the largest freight factors are not necessarily the ones that are most sensitive to changes in transport costs.

Sarangan's study contains a vast amount of empirical data but no statistical analysis.[3] Freight factors based on f.o.b. values are used but only as an illustration of how transport costs vary for the same

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[1]Ibid., p. 8.

[2]Ibid., p. 13.

[3]Sarangan, Liner Shipping in India's Foreign Trade.

product depending on the destination. Some freight rates are presented for exports from competing suppliers of various Indian export products. It is usually left to the reader to draw his own conclusions about the effects of the existing rate structure on Indian exports. There are some exceptions. For example, it is argued that Indian tea can compete with tea from other countries provided that no advantage on freight and shipping service is allowed to competing countries. Indian tea is therefore not competitive on the New Zealand market as one of India's main competitors (Ceylon) has a competitive advantage, in that there are more frequent sailings, and the freight rate is slightly lower on the Ceylon-New Zealand shipping route.[1]

It can be concluded from this brief survey that the lack of research on the effect of transport costs on trade flows is conspicuous. The studies using distance as proxy for, or instead of, transport costs are not very useful, since it is not possible to separate the psychological effects of distance from the pure cost effects of having to overcome distance. Therefore the results do not have any policy implications. Munro's study is unsatisfactory because of its reliance on freight factors. This does not invalidate his book as a source of information on various transport policies and regulations affecting the United States and Canada.

It was emphasized in the first essay that if transport costs are to be introduced, location theory should be included as well. Several empirical studies indicate that nationally, transport costs are an

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[1]Sarangan, p. 64.

important locational factor for relatively few industries.[1] Whether this is true internationally as well needs to be investigated. If they are important, an increase in transport costs in a certain part of the world would be expected to lead initially to substitution between various sources of import supply and domestic supply. If the change were expected to remain over time, weight-losing industries would move closer to raw material sources and weight-gaining closer to the market. If the change involves the crossing of a national border, the structure of trade will not be the same.

Locational change is beyond the scope of this study. The model presented below will try to quantify the effect of transport costs on the structure of trade in some Canadian export commodities. The analysis is cross-section and therefore the dynamic aspects of transport costs will be by-passed.

The Model

The model, which is presented below, is intended mainly to test the significance of transport costs in explaining the variation in the value of Canadian exports of some commodities to different countries in a given year. For example, in 1969, Canada exported 60 billion dollars' worth of newsprint to the United Kingdom and only 260 million dollars' worth to France. The model is designed to quantify how much of this difference is caused by a difference in transport costs to the two markets. If transport costs is the focus of attention, it could be argued

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[1]See for example, G.C. Cameron and B.D. Clark, Industrial Movement and the Regional Problem (Edinburgh: Oliver and Boyd Ltd., 1966), p. 164.

that a two variable regression (value of exports on transport costs) would be sufficient. It is a well-known problem in econometrics, however, that if other factors have important explanatory power as well, they may introduce so-called "nuisance effects" and distort the influence of the independent variable. Therefore other variables as well as the transport cost variable were included in the model. It should be strongly emphasized that the intention of the model and the analysis in this essay is not to test or develop a theory of trade.

As recalled, Linneman developed the following model for aggregate trade flows:

$$X_{ij} = b_1 \; Y_i^{b_2} \; N_i^{-b_3} \; Y_j^{b_4} \; N_j^{-b_5} \; D_{ij}^{-b_6} \; P_{ij}^{b_7} \qquad (1)$$

where X_{ij} = estimated exports of country i to country j
Y_i = GNP of exporting country i
N_i = population of exporting country i
Y_j = GNP of importing country j
N_j = population of importing country j
D_{ij} = geographic distance between i and j
P_{ij} = dummy variable for preferential trade agreement, affecting trade between i and j

Y_i and N_i indicate total potential supply and Y_j and N_j total potential demand. D_{ij} is a proxy variable for natural trade impediments. Artificial trade impediments, such as tariffs, are assumed to be equal between all countries. The only factor that may cause them to be unequal are preferential trade relations (P_{ij}).

In order to use Linneman's model for a study of one country's export of one product to other countries, a few adjustments are necessary. In the first place, total potential supply of the commodity by the exporting country to each importing country can be assumed equal. (For example, the potential supply of Canadian newsprint to the United Kingdom equals that to France and that to Italy). Therefore, variables

Y_i and N_i are no longer needed. Also the subscript i can be deleted and replaced by a subscript k for commodity k.

Y_j and N_j are variables for potential demand of the importing country. Ideally, a variable for domestic consumption of commodity k in country j should be used instead of the GNP variable Y_j. This was not possible because of lack of suitable data, so Y_j was retained as a proxy for domestic consumption. This implies that in a given year, a country with a larger GNP will, everything else the same, consume and import more of commodity k from the exporting country than a country with a smaller GNP.

Linneman assumed that a large population implies a large domestic production as economies of scale will have been achieved in many commodities. Therefore, the larger the population of the importing country (N_j), the lower its imports. The variable N_j was discarded as being unsuitable at the disaggregated level. Britain has a larger population than Norway, but this does not necessarily indicate that she will have a larger production of a given commodity as well. A variable for domestic production of k in country j ($Prod_{kj}$) was inserted in its place.

D_j stands for natural impediments to trade, meaning both transport costs and the psychological effects of distance. This variable was deleted and a variable F_{kj} used in its place. F_{kj} is transport costs of commodity k to country j.

Linneman's assumption of equal artificial trade impediments was dropped and a variable for tariffs (T_{kj} = tariff on commodity k in country j) was introduced. An examination of Table 21 in the appendix shows that the tariff on a certain commodity is far from equal in dif-

ferent countries.

The preferential trade factor was retained. Even though trade preferences are to some extent reflected in tariff rates, the variations in these rates do not tell the whole story. A country can be discriminated either for or against compared to her competitors (trade diversion in Viner's sense). Two dummy variables were used to indicate trade preferences: D_{1j} for the importing country being a member of a free trade area or customs union, and D_{2j} for the importing country being a member of the Commonwealth. As the country selected for study is Canada, D_{1j} indicates discrimination against Canadian exports and D_{2j} in favour of Canadian exports.

After these adjustments, the model is

$$X_{kj} = c_0 \, T_{kj}^{-c_1} \, F_{kj}^{-c_2} \, \mathrm{Prod}_{kj}^{-c_3} \, \mathrm{GNP}_j^{-c_4} \, D_{1j}^{-c_5} \, D_{2j}^{c_6} \qquad (2)$$

where X_{kj} = estimate of exports of commodity k to country j
T_{kj} = tariff on commodity k in country j
F_{kj} = transport cost of commodity k to country j
Prod_{kj} = production of commodity k in country j
GNP_j = country j's GNP
D_{1j} = dummy variable for country j being a member of a free trade area or a customs union
D_{2j} = dummy variable for country j being a member of the Commonwealth

What does this model imply about the demand and supply of commodity k in country j? It is important to remember that the analysis is cross-section. This means that production in a country can be regarded as fixed, but the supply available for exports to a particular country is not. If, for example, Canadian exports of newsprint to France constitute a small percentage of total Canadian newsprint production in a given year, it can be assumed that this supply of exports to France can be expanded relatively easily within a short period of

time, by simply diverting sales destined for other countries, or for home production, to France. It is therefore assumed that the elasticity of supply of home production of commodity k in country j is zero, and the elasticity of supply of Canadian exports of commodity k to country j is infinite.

In order to understand the implications of the model, diagrammatic analysis is useful. In Figure 2, S_{k1c} and S_{k2c} are the Canadian supply curves of commodity k in countries 1 and 2. S_{k1d} and S_{k2d} are the domestic supply curves of commodity k, and D_{k1} and D_{k2} are the demand curves for the commodity in countries 1 and 2. The slopes of the demand curves are identical, but their intercepts are influenced by the GNP. The Canadian export price OA is the same in both countries 1 and 2.

If Canada is the sole supplier of commodity k, and if there are no transport costs and no tariffs, country 1 will import CD of k at a price of OA dollars, and country 2 will import NM at the same price. Assume now that transport costs exist and that they are AE dollars per unit of commodity k shipped to country 1 and AS to country 2. Then country 1 will not import any k from Canada, while country 2 will import NY units. The introduction of tariffs will shift the supply curves further upward, but provided the tariff in country 2 is smaller than RS, Canada will continue to export k.

What happens if a third country is introduced, also exporting the same product? Whether or not Canada will retain her export market in country 2 will depend on: (1) the export price of k in country 3, (2) the transport cost of k between countries 2 and 3, (3) the tariff encountered by country 3 on commodity k in country 2. The duty may

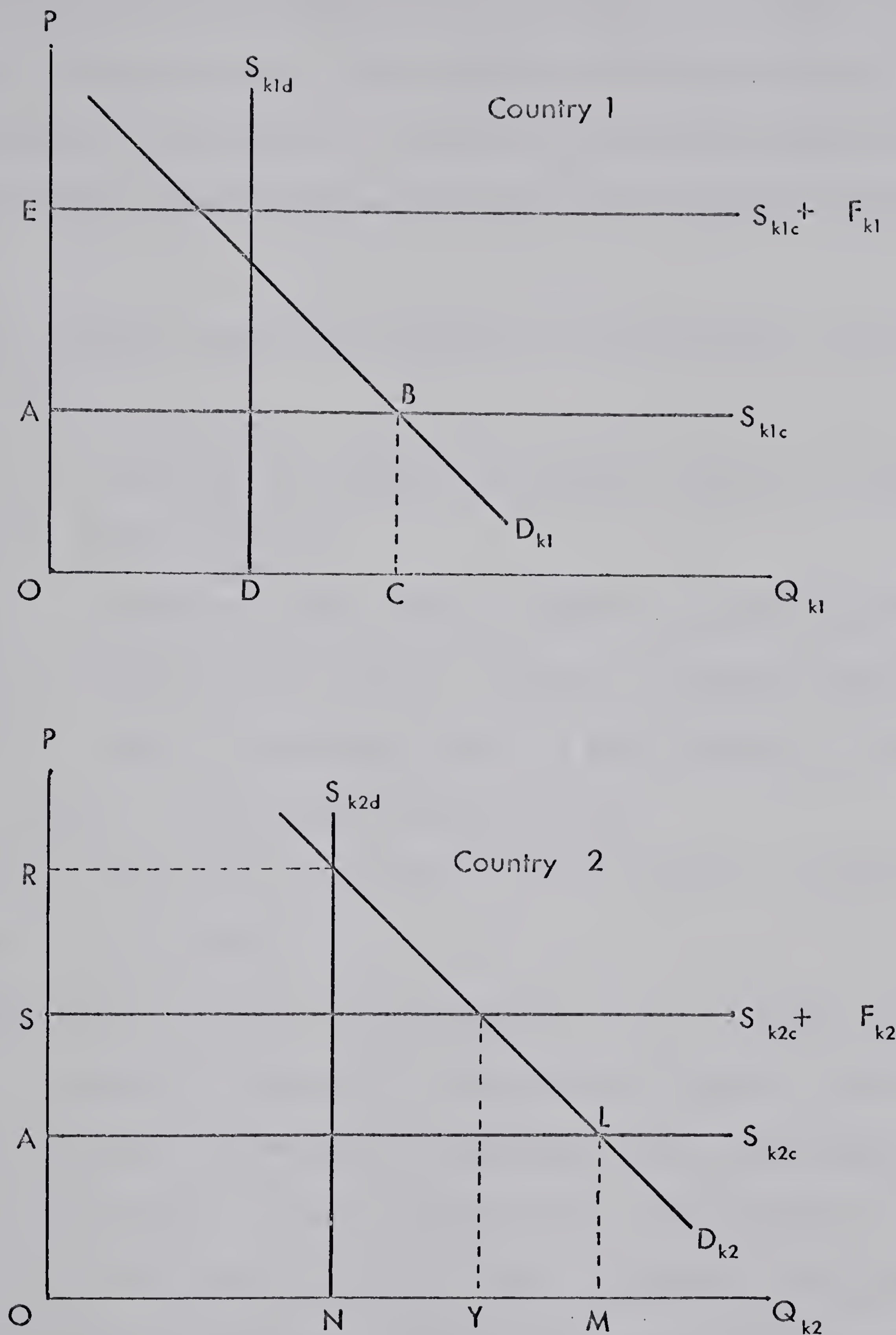

FIG. 2

HYPOTHETICAL SUPPLY AND DEMAND SCHEDULES
FOR COMMODITY k in COUNTRIES 1 AND 2

be different from that encountered by Canada (even if export prices are equal) if tariffs are calculated on c.i.f. value, or if there is a preferential trade agreement either between Canada and country 2, or between country 2 and country 3. Canada will lose her exports of k to country 2, if the Canadian-delivered price of k is higher than that of country 3.

The following simplifying assumptions are therefore necessary for model (2).

(1) The elasticity of supply of a country's exports to each other country equals infinity.[1]

(2) The exporting country does not practice price discrimination

(3) The elasticity of supply of domestic production equals zero

(4) The slope of the demand curves in each country is identical but the intercept is a positive function of GNP

(5) The delivered price of the exporting country's competitors is the same in each market.

Assumptions (1) and (2) are necessary if f.o.b. export prices are to be excluded from the model. Assumption (4) implies that tastes are ignored and also the industrial structure of the importing country. For a country to import a primary manufacture, it has to have an industry which will use this manufacture as an input. Assumption (5) places a severe restriction on the model. Ideally, the model should include an

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[1]This assumption is not necessary as it is contained in assumption (2). It is included for expositional purposes.

index of delivered prices (including tariffs) of the exporting country's competitors in each market. This was not possible to do, as the required import statistics were not available at the time this study was undertaken. It has to be remembered that the main intention of the model is to quantify the effect of transport costs on the structure of Canadian exports in some products.

The Final Model

The model needs to be specified in terms of units of measurement. Some additional simplifications, apart from those introduced above, are also necessary.

Transport costs are restricted to ocean transport costs. To include land transport costs as well, the exact place where the export shipment originates must be known, and also its destination and its mode of transport (truck or rail).[1] This information is not included in the available statistics.

The exclusion of land transport costs is certainly a serious limitation. A recent OECD study showed that ocean transport costs constitute between 30 and 60 per cent of total transport costs for trans-Atlantic trade.[2] Therefore, it could be argued that the influence of ocean transport costs might be overshadowed by the effects of land transport costs. Insofar as the production of each commodity is concentrated in a certain region of Canada, the Canadian land transport costs

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[1]The many difficulties involved in studying land transport costs are illustrated in Munro's study.

[2]OECD. Ocean Freight Rates as Part of Total Transport Costs (Paris: OECD, 1968).

will not invalidate the effects of ocean transport costs, as land transport costs will be approximately the same regardless where the commodity is exported to. This is not the case for commodities such as woodpulp and newsprint where production is spread over a large area of Canada. This does not necessarily imply that exporters are also spread over a large area of Canada. In order to minimize the extent of land transport for the importing country, only countries bordering on the sea have been selected.

Ocean transport costs were expressed as a percentage of f.o.b. unit value. There are two reasons for this: (1) In order to be able to run some regressions over several commodities with varying unit values, it was necessary to express the freight rate as a percentage of price; (2) It is computationally easy to work with.[1]

To make the regression coefficients of transport costs and tariffs directly comparable, the duty rates were expressed as a percentage of f.o.b. unit value instead of the customary c.i.f. unit value.

Both the production variable and the GNP variable are lagged one year. It is reasonable to expect importers to base one year's demand on conditions that existed in the previous year. Ideally, real GNP should be used in preference to nominal GNP, but the problems of international price comparisons are well known.[2] Linneman used both real

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[1]See below, p. 138.

[2]See for example Milton Gilbert and Irving B. Kravis, An International Comparison of National Products and the Purchasing Power of Currencies (Paris: OEEC, 1954).

and nominal GNP data and found no significant differences in the results.[1] For these reasons, nominal GNP values have been used.

No specific mathematical form was imposed on the model prior to the testing.[2] The final model (model 3) is

$$X_{kj} = F(\underset{-}{T_{kj}}, \underset{-}{F_{kj}}, \underset{-}{Prod_{kj}}, \underset{+}{GNP_j}, \underset{-}{D_{1j}}, \underset{+}{D_{2j}}) \qquad (3)$$

X_{kj} = value of Canadian exports of commodity k to country j (thousands of dollars)
T_{kj} = nominal tariff on commodity k by country j, expressed as a percentage of f.o.b. unit value
F_{kj} = freight rate on commodity k from Canada to country j, expressed as a percentage of f.o.b. unit value
$Prod_{kj}$ = domestic production of commodity k in country j in the previous year[3]
GNP_j = nominal GNP in country j in the previous year (billions of dollars)
D_{1j} = Dummy variable. D_{1j} = 0 if country j is not a member of a free trade area or common market; D_{1j} = 1 if it is
D_{2j} = Dummy variable. D_{2j} = 0 if country j is not a member of the Commonwealth; D_{2j} = 1 if it is.

In conclusion, it should be strongly emphasized that the postulated model will not and cannot explain all the variations in demand for Canadian exports of the selected products. If the model were to be completely specified, a considerable amount of research would have to be undertaken into the structure of the economy of each importing country, into the character of competing commodities, and into the industries in which the commodities are used as inputs.[4]

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[1]Linneman, p. 84.

[2]By specific form is meant a linear, or log-linear (log-log), or semi-log model.

[3]For units of measurement for the production variable, see below, p. 129.

[4]As mentioned above, the position of Canada's competitors should also be considered in each market.

The Data

The year chosen for study was 1969. As mentioned in Chapter 3, this was the most recent year for which freight rates were available on a comprehensive basis. The sample of the commodities, countries, and the value of exports are given in Table 16, Appendix.[1] The Canadian trade classification was used in preference to the SITC classification as it is more detailed.

Tariffs were obtained from various issues of the International Customs Journal and GATT's publication, Legal Instruments, Embodying the Results of the 1964-1967 Conference, Volumes I-V. Some difficulties were encountered in matching commodities with the chosen degree of aggregation with commodities classified according to the BTN, and other classifications used in the Customs Journals. For example, when different tariffs were quoted on different types of agricultural machinery, a weighted average (weighted by exports) was used. In those cases where the BTN classification was more detailed than the Canadian export classification, a simple average of the quoted duties was used. In some cases the rates were not quoted on an *ad valorem* basis, but, for example, in Swedish crowns per kilo or Israeli pounds per gallon. In those cases, the currency was converted into Canadian dollars, the rate expressed per short ton using stowage factors where appropriate, and then expressed as a percentage of the Canadian f.o.b. unit value. All duties that were quoted on c.i.f. value were converted to an f.o.b. basis. All these calculations and conversions introduce sources of errors,

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[1]Note that the Philippines are included here, while they were not in the analysis of the previous chapter. The reason is that the freight rates are identical for Japan and the Philippines and therefore it was previously only necessary to include Japan.

which on the average may cancel one another. The calculated customs rates are given in Table 21, appendix.

There were no difficulties in matching export data with the freight rates, since the freight rates had been selected with the export data in mind. However, the freight rates presented in Table 18, appendix, had to be adjusted. One freight rate is needed for the analysis, while three are usually available for exports to each country (from Montreal, from Toronto, and from Vancouver). Therefore, a weighted average of the three was used for each country, the weights being the percentage distribution of exports over the three ports.

The shipping statistics contain information on the movement of exports of some commodities over Montreal, Toronto and Vancouver.[1] The commodities relevant to the present study are: frozen fish, canned fish, wheat flour, tobacco, distilled alcoholic beverages, lumber, woodpulp, plywood and veneer, newsprint, steel bars and rods, plate sheet and strip steel, aluminum and alloys, copper and alloys, nickel and alloys, wire and cable, passenger automobiles and chassis, and general cargo. Thus some of the commodity classes are broader than the ones used in this study and some commodities are not listed at all. The shipping data for frozen fish, canned fish, distilled alcoholic beverages, plywood and veneer, and lumber, have been used to indicate the distribution between ports of the exports of frozen salmon, canned salmon, whiskey, plywood, and hemlock. As Douglas Fir grows only in Western Canada, it

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[1]Dominion Bureau of Statistics, <u>Shipping Report, Part 1</u>. The preliminary 1969 report was obtained from the DBS.

has been assumed that it is only shipped from Vancouver. The distribution of "general cargo" has been used to indicate the distribution of exports of the remaining commodities.

The average freight rates were expressed as percentages of the unit values. The resulting freight factors are presented in Table 19 (Appendix). The starred freight factors in the table have not been included in the analysis as they are not accurate. Freight rates were available only for one port, while according to the Shipping Report, the exports went over several ports. The fact that some commodities were exported over United States ports has been ignored.[1] It is belived that this diversion is not caused by lower transport costs but by the better services offered.[2] Container rebates have been ignored, and the contract rates have been used consistently.

GNP data were obtained from International Financial Statistics, various issues. These were converted into Canadian dollars by the appropriate exchange rate. (See Table 22, appendix).

Production data on the scale that is necessary for this analysis are difficult to obtain. Production figures for sawn wood, wheat flour, tobacco, wood-pulp, newsprint, steel, worked aluminum, worked copper, and passenger automobiles were obtained from the United Nations Yearbook of Statistics, 1969. Statistics on fish catches, obtained from

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[1]Exports by Mode of Transport, 1969 indicates that some of the overseas exports of whiskey, frozen salmon, telephones, and machinery leave Canada by rail or truck. This implies that they are shipped from United States ports. Aircraft engines, telephone apparatus, and card punching machinery are mainly exported by air. Therefore a weighted average of the ocean freight rate and the air freight rate was used. Air cargo rates were obtained from Air Canada.

[2]Personal correspondence with Mr. Hiland of the Industrial Services Branch of the Department of Industry, Trade, and Commerce.

the same source, were used in the equations for canned salmon and frozen salmon. For all other commodities, a country's export of the commodity was used as a proxy variable for its production of the same.[1] This is not entirely satisfactory for secondary manufactures, which are typically non-homogeneous in character. If the products are differentiated, large exports do not necessarily exclude large imports as well. The difference between the export product and the import product may not be apparent in the available statistics. This limitation also affects the production statistics, as the production data are more aggregated than the Canadian export data.

The Caribbean Free Trade Area was not included among the trade preference areas, as its first year of operation was 1968. It is assumed that its full effects were not realized in 1969.

The Results of the Regressions

As emphasized above, the model is not intended as a theory of trade in the selected products. It is highly unlikely that the model will have the same explanatory power for Canadian exports of frozen salmon as for Canadian exports of copper. Therefore, the model was not strictly adhered to in that variables with wrong signs were dropped and in few instances, new variables were tried.

Generally, the model behaved reasonably well for primary manufactures and some of the cruder secondary manufactures. The "best"

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[1] Export data were obtained from the United Nations World Trade Annual, 1968. For complete information on the production and export data, see Table 23, appendix.

regressions for these commodities are presented in Table 11. The regressions for copper tubing, wire and cable, telephone apparatus, passenger automobiles, aircraft engines, aircraft assembly, agricultural machinery, construction machinery, and card punching and sorting machinery gave unsatisfactory results in terms of signs and significance of the regression coefficients. A variable for per capita GNP in country j (C_j) was inserted in these regression equations to test the hypothesis that, tastes (or a country's stage of development) are important in determining the demand for imports. As Canada's per capita GNP is higher than any of the countries included, the variable in effect tests the hypothesis that per capita income differences are important, i.e. Linder's hypothesis.[1] Linder postulated that the more similar the income structure, the larger the trade, while more orthodox trade theory would come with the opposite prediction. Therefore, a "two-tailed" test was employed, that is, no sign was imposed on the coefficient in advance. The statistics on per capita GNP are presented in Table 22 in the appendix.

The regressions for copper tubing, wire and cable, passenger automobiles, telephone apparatus, and card punching machinery are presented in Table 12. The regressions for aircraft engines, aircraft assembly, construction machinery, and agricultural machinery were abandoned as no reasonable results were obtained. This presumably indicates that the structure of Canadian exports in these commodities is determined by other variables than the tested ones. It is possible that

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[1] Staffan Burenstam-Linder, An Essay on Trade and Transformation (Uppsala: Almqvists & Wicksells, 1961).

TABLE 11

RESULTS FROM REGRESSIONS ON MODEL 3

Commodity	Rel	No.	Int.	T (-)	F (-)	Prod. (-)	GNP (+)	D_1 (-)	D_2 (+)	$\bar{R}^2$	F	S.e.
Frozen salmon (P)	LL	19	-17.07	-0.556 (-2.39)*	4.045 (0.69)	-0.112 (-0.25)	3.306 (2.43)*	-	-	0.341	3.32*	6.49
Canned salmon (P)	LL	18	12.74	-0.224 (-1.19)	-7.654 (-1.48)**	-0.558 (-2.17)*	1.89 (2.23)*	-	-	0.209	2.13	4.00
Whiskey (P)	LL	19	35.94	-0.200 (-1.44)	-9.01 (-2.56)*	-0.264 (-2.68)*	0.883 (1.75)*	-	-	0.475	5.07*	3.11
Wheat flour (P)	LL	21	33.38	-0.033 (-0.18)	-10.460 (-2.83)*	-0.240 (-1.53)**	0.282 (0.25)	-	-	0.223	2. 6	6.79
Tobacco (P)	LL	19	5.15	-	-7.049* (-3.04)	-0.11 (-0.63)	-	-	6.148 (1.63)**	0.333	4.00*	7.00
Hemlock (P)	LL	18	27.26	-	-15.34 (-2.12)*	-0.070 (-0.32)	3.341 (2.57)*	-	-	0.356	4.135*	7.31
Douglas Fir (P)	LL	18	21.39	-	-12.857 (-1.67)*	-0.190 (-0.83)	3.223 (2.32)*	-	-	0.271	3.10*	7.84
Plywood (P)	L-LL	19	13084.0	-631.84 (-3.49)*	-7155.05 (-2.51)*	-366.03 (-2.79)*	3881.6 (4.27)*	-	10483.74 (4.22)*	0.768	12.94*	3463.5
Woodpulp (P)	L	18	5136.7	-89.43 (-0.64)	-192.55 (-0.54)	-1.204 (-1.33)**	255.45 (7.43)*	-	3716.16 (1.15)	0.793	13.98*	5618.89
Newsprint (P)	LL	21	38.04	-	-13.51 (-2.08)*	-0.06 (-0.27)	1.91 (1.29)	-	8.17 (1.99)*	0.206	2.29	7.59
Resins	L	19	163.55	-4.65 (-0.98)	-0.83 (-0.07)	-	3.45 (1.59)**	-	344.51 (1.49)**	0.08	1.42	424.41
Steel Bars	L	19	526.53	-2.658 (-0.96)	-26.376 (-1.33)**	-0.0018 (-0.18)	0.263 (0.17)	-94.07 (-0.58)	241.91 (1.45)**	0.14	1.50	242.65
Sheet & Str. steel	L	19	2332.32	-	-150.17 (-2.82)*	-	7.167 (1.77)	-935.14 (-1.81)*	425.38 (0.77)	0.406	4.07*	816.33

TABLE 11 (CONTINUED)

Commodity	Rel	No.	Int.	T (-)	F (-)	Prod. (-)	GNP (+)	D_1 (-)	D_2 (+)	$\bar{R}^2$	F	S.e.
Aluminum (P)	LL	18	4.16	-0.033 (-0.23)	-4.799 (-1.00)	-0.429 (-2.94)*	3.163 (3.77)*	-	–	0.543	6.05*	3.59
Copper (P)	L	19	30599.34	-955.29 (-3.83)*	-9958.82 (-4.29)*	-22.73 (-0.93)	211.53 (2.52)*	-7218.74 (-1.08)	39967.5 (4.61)*	0.71	8.22	11216.5
Nickel (P)	L	21	3491.98	-	-1723.23 (-1.89)*	-	0.125 (3.113)*	-	4529.65 (2.66)*	0.603	11.08	2997.20
Nuts and Bolts	L	19	76.47	-0.237 (-0.41)	-8.077 (-1.11)	-0.0016 (-1.03)	0.511 (0.91)	-9.268 (-0.41)	33.302 (1.30)	-	1.16	38.84

Notes: Rel. = relation
LL = double log
L-LL = semi log, indep. var.,logarithmic
L -= linear
No. = number of observations
T = tariffs
F = transport costs
Prod. = domestic production
GNP = gross national product
F = value of the F-ratio

P = primary manufacture
D_1 = dummy variable for membership in a free trade area
D_2 = dummy variable for Commonwealth preference
R = corrected coefficient ofddeterm.
S.e. = standard error of the estimate

* = significant at the 5 per cent level
** = significant at the 10 per cent level

TABLE 12

RESULTS FROM REGRESSIONS ON MODEL 3, PER CAPITA GNP INCLUDED AS INDEPENDENT VARIABLE

Commodity	Rel.	No.	Int.	T (-)	F (-)	GNP (+)	D_1 (-)	C	$\bar{R}^2$	F	s.e.
Copper tubing	L	19	882.56	-16.03 (-0.98)	+37.66 (0.60)	-	-189.10 (-0.39)	-223.51 (-0.81)	-	1.23	1704.96
Wire and Cable	L	19	449.71	-3.86** (-1.43)	-27.704 (-0.55)	-	-	-118.227* (-2.25)	0.11	1.73	82883.
Passenger automobile	L	19	8056.19	-	-225.45 (-2.07)*	-	-1299.44 (-2.01)*	-1089.10 (-1.07)	0.19	2.47	91432.
Card. punch. machinery	L	19	201.51	-	+0.72 (0.36)	17.82* (5.76)	-319.85 (-0.82)	-47.32 (-0.24)	0.667	9.49*	93649.
Telephone apparatus	L	19	6092.70	-15.83 (-0.63)	-517.06 (-0.77)	-	-355.43 (-1.64)**	-973.95 (-0.32)	-	1.36	1726.93

Notes: For abbreviations, see notes to Table 11. C = per capita GNP

the geographical features of the importing countries are of some importance in determining the need for these commodities.

For primary manufactures, the GNP variable was significant in ten cases out of a possible thirteen. It had the wrong sign for tobacco. Tastes may here have distorted the effect of income. The relation appears to be much weaker for secondary manufactures. It was significant only for sheet and strip steel and card punching machinery. It had the right sign for steel bars, nuts and bolts, and resins. This possible difference between primary and secondary manufactures will be further investigated below.

The production variable was significant in five out of thirteen cases for primary manufactures. It had the right sign for all others with the exception of nickel, where exports were used as a proxy for domestic production. It is therefore possible that the positive sign is caused by differences in classification in the Canadian statistics and the SITC statistics.

The per capita GNP variable was significant and negative for wire and cable and negative for the other four regressions. The relation is weak, but lends itself to a tentative rejection of Linder's hypothesis for these commodities. The alternative hypothesis can be accepted for wire and cable: the larger the per capita income differences, the larger the trade.

Of the two preference variables, Commonwealth preference appears to be more important for Canadian exports. It was significant for copper, newsprint, nickel and plywood and had the right sign for six additional variables. Existing free trade areas are detrimental to

Canadian exports of sheet and strip steel, and passenger automobiles. The variable (D_1) had the right sign for an additional five commodities, only one of which was a primary manufacture. This agrees with the observed tariff rates of the Common Market and EFTA countries (Table 21, appendix). These are generally higher on the secondary manufactures selected than on the primary manufactures, which implies that the discrimination is larger for secondary manufactures.

The estimated coefficients for the tariff variable were significant for plywood, frozen salmon, and copper. They were significant on the ten per cent level for wire and cable and whiskey. They did not have the right sign for eight out of a possible twenty-two commodities. The transport cost variable, on the other hand, was significant for whiskey, wheat flour, tobacco, hemlock, plywood, newsprint, sheet and strip steel, copper, nickel, and passenger automobiles. It had the wrong sign for only three commodities: frozen salmon, copper tubing, and card punching machinery. It should also be noted that for most commodities, with the exception of resins, the coefficient of the transport cost variable is larger than that of the tariff variable.

Why does the transport cost variable appear to be more important than the tariff variable in this type of model? When the model was developed, it was assumed that the delivered price of Canada's export of commodity k to country j was equal to the sum of the f.o.b. export price (P_k), the tariff (T_{kj}) and the transport costs (F_{kj}). The f.o.b. export price was assumed to be the same regardless of which is the importing country j. The lower Canada's delivered price of commodity k to country j compared to that of her competitors, the larger her ex-

ports. Therefore, there are three factors affecting her competitive position: relative f.o.b. export prices, relative transport costs, and relative tariffs. If no preferential tariffs are present, and if f.o.b. prices are equal for all suppliers, relative transport costs of commodity k are likely to show larger variation between different import markets than relative tariffs. Relative tariffs will show some variation if tariffs are calculated on the c.i.f. value, but this variation is due to transport costs and not to tariffs. Transport costs are discriminatory in nature, for they vary for all suppliers, while tariffs do not. Therefore transport costs will have a larger effect on relative prices than tariffs, and therefore on Canada's competitive position in each market.

In summary, both tariffs and transport costs have a consumption effect. The production effect is absent as domestic supply is assumed to be perfectly inelastic. In addition to the consumption effect, transport costs have a discriminatory effect. Tariffs, if prohibitive, are prohibitive for all imports of commodity j, if pre-tariff prices are the same for all countries, while transport costs may only be prohibitive for imports of commodity j from one particular country.

As mentioned above, tariffs are discriminatory as well, if preference areas exist. The discriminatory effects of tariffs, as far as they influence Canadian exports are contained in variables D_{1j} and D_{2j}.

Only the coefficients estimated from the log-linear regressions are comparable to each other. Therefore it was deemed useful to convert all significant coefficients to a uniform basis. The unit chosen was

elasticity of demand for Canadian exports with respect to a change in transport costs (E). A few calculations demonstrate that a log-linear relation in effect gives this elasticity as a coefficient for the freight factor. The log-linear relation can be written:

$$\ln pq = \ldots a \ln \frac{F\ 100}{P} + \ldots$$

where p is price (by assumption constant), q is quantity, F is the nominal freight rate and a is the estimated coefficient. Differentiate partially with respect to F:

$$\frac{\partial pq}{\partial F}\frac{1}{pq} = \frac{a}{F}$$

$$a = \frac{\partial q}{\partial F}\frac{F}{q}$$

that is, the coefficient a is equal to E.

Similarly, for the semi-log regression:

$$pq = \ldots + b \ln \frac{F\ 100}{P} + \ldots$$

where b is the estimated coefficient. Differentiate partially with respect to F:

$$\frac{\partial pq}{\partial F} = \frac{b}{F}$$

$$b = \frac{pF\ \partial q}{\partial F}$$

Thus in order to get E, b must be multiplied by $\frac{1}{pq}$.

For the linear regressions:

$$pq = \ldots + c\ \frac{F\ 100}{p} + \ldots$$

$$\frac{\partial pq}{\partial F} = c\ \frac{100}{P}$$

$$c = \frac{\partial q\ p^2}{F\ 100}$$

Therefore $E = c \dfrac{\frac{100\ F}{p}}{pq}$

c is multiplied by the average freight factor and divided by the value of Canadian exports. Both these figures are readily available from the regression analysis.

All the calculated transport cost elasticities are presented in Table 13. It should be remembered that these elasticities are cross-section elasticities and that they are only valid under certain assumptions. As recalled, these assumptions are:

1. The elasticity of supply of Canada's exports of the commodity to each country equals infinity;
2. Canada does not practice price discrimination;
3. The elasticity of supply of domestic production in each importing country equals zero;
4. The slope of the demand curves in each importing country is identical, but the intercept is a positive function of GNP;
5. The delivered price of Canada's competitors is the same in each importing country.

These transport cost elasticities also ignore the fact that a change in transport costs causes a change in tariffs as well. Tariffs in this analysis are expressed as a percentage of the f.o.b. unit value:

$$\frac{(p+F)\ t}{p}$$

where t is the tariff expressed as a percentage of the c.i.f. value. The relevant part of the log-linear regression is

$$\ln pq = e \ln \frac{(p+F)\ t}{p} + \ldots$$

e is the estimated coefficient for the tariff variable. Differentiate partially with respect to F:

$$\frac{\frac{\partial pq}{\partial F}}{pq} = \frac{e\frac{t}{p}}{\frac{(p+F)t}{p}}$$

In elasticity form: $\frac{\partial q}{\partial F}\frac{F}{q} = e\frac{1}{p+F}$

Similar solutions can be found for the linear and semi-log relations. These elasticities should be added to the estimated transport cost elasticities. They were calculated for whiskey, plywood and copper and are all extremely small (-0.057 for whiskey, -0.061 for plywood, and -0.0002 for copper). They were therefore ignored.

The transport cost elasticities could also be converted into price elasticities. The delivered price of a commodity in each market is p + F + T, where p is assumed to be constant, being the Canadian f.o.b. price. If there is a change in the final price, which is caused by a change in transport costs only, the elasticity of demand can be written:

$$\frac{dq}{dF}\frac{p+T+F}{q}$$

again ignoring the effect of a change in transport costs on tariffs. Thus to get the price elasticity, each transport cost elasticity would have to be multipled by $\frac{p+T+F}{F}$. This ratio is always larger than one and is likely to be quite large if transport costs are small in relation to the f.o.b. price. This cross-section price elasticity is not very useful, however, as the following qualification would always have to be added: if the change in price is caused by a change in

TABLE 13

ESTIMATED TRANSPORT COST ELASTICITIES FOR SOME CANADIAN EXPORT COMMODITIES

Commodity	Rel	Elasticity
Canned salmon	LL	-7.654**
Whiskey	LL	-9.01*
Wheat Flour	LL	-10.46*
Tobacco	LL	-6.54*
Douglas Fir	LL	-12.85**
Hemlock	LL	-15.34*
Plywood	L-LL	-3.11*
Newsprint	LL	-13.51*
Steel bars	L	-3.88**
Sheet and Str.	L	-4.01*
Copper	L	-3.70*
Nickel	L	-2.34*
Pass. auto.	L	-4.94*

Notes: L = linear model

LL = log-linear model

L-LL = semilog model

* = significant at 5 per cent level

** = significant at the 10 per cent level

transport costs only.[1]

It is evident from Table 13 that some Canadian export commodities are extremely sensitive to changes in transport costs.[2] If transport costs are important in determining the structure of exports in these commodities, then delivered price must be important in influencing the demand for the Canadian product. If these elasticities are correct, it could be implied that Canada encounters particularly strong price competition in the overseas markets for lumber and newsprint. It is also interesting that four of the commodities are consumer goods, which confirms that consumers are price conscious. The fact that transport costs were not an important explanatory variable for commodities such as wire and cable, copper tubing, construction machinery, aircraft engines and assembly, agricultural machinery, and card punching machinery probably lends support to the hypothesis that design, quality, and taste are more important for these and similar commodities. So it seems that transport costs may be more important for primary manufactures than secondary manufactures, the main reason being product differ-

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[1]This qualification is necessary, as a change in f.o.b. price may have a different effect on demand than a change in transport costs or tariffs. For discussion and evidence on differences in reactions to changes in prices and tariff rates, see Bela Balassa and associates, Studies in Trade Liberalization (Baltimore, Md.: The Johns Hopkins Press, 1967), p. 317.

[2]One obviously has to be fairly careful in comparing the elasticities obtained from the log-linear model with those from the semi-log or linear model. The log-linear model appears to give larger elasticities than the linear or semi-log model and these larger elasticities also show larger variations than the others. This has been documented elsewhere. Stone found that estimated income elasticities based on a double log model were invariably larger than those based on a semi-log model. (Richard Stone, The Measurement of Consumers' Expendituresand Behaviour in the United Kingdom, 1920-1938 (Cambridge: Cambridge University Press, 1954), pp. 97-98.)

entiation. This contradicts the previously estimated time series import elasticities, which are usually higher for secondary manufactures than for primary manufactures.[1] The explanation for this possible discrepancy is probably that in time series studies domestic production is allowed to vary. As primary manufactures are raw material oriented, it is presumably easier to expand the production of secondary manufactures in response to higher import prices, than primary manufactures if the raw materials are not available within the country. The analysis presented here is cross-section and is concerned with the structure of one country's exports of some commodities at a point of time. The import elasticity studies work with total imports, while here only imports from one country, Canada, are of interest. Therefore the findings here do not necessarily contradict the previous findings.

To test the hypothesis thattransport costs are more important for primary manufactures than for secondary manufactures, all observations were pooled into one equation and the dummy variable technique presented in the previous essay was used again. The variable for production was not included, as sometimes production data and sometimes export data were used in the initial regressions.

Table 14 indicates that the difference between the coefficients for the transport variable for primary and secondary manufactures is

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[1]B.A. de Vries, "Price Elasticities of Demand for Individual Commodities Imported into the United States," Staff Papers, II (April, 1951), pp. 397-419; R.J. Ball and K. Marwah, "The U.S. Demand for Imports, 1948-1958," The Review of Economics and Statistics, 44 (Nov., 1962), pp. 395-401 and others.

TABLE 14

RESULTS FROM REGRESSION INCLUDING ALL COMMODITIES
(DUMMY VARIABLE TECHNIQUE)

Variable	Coefficients		
	Primary manuf.	Secondary man.	Slope coefficient
Intercept (log)	-2.32	1.05	-3.39 (-1.32)
Tariffs	-0.026 (-0.38)	-0.08 (-0.83)	0.051 (0.44)
Transport Costs	-1.585 (-3.05)*	-0.674 (-1.68)*	-0.911 (-1.39)**
GNP	2.329 (6.104)*	0.417 (1.02)	1.91 (3.35)*
D_{1j}	-0.593 (-0.45)	-0.476 (-0.342)	-0.11 (-0.06)
D_{2j}	2.422 (1.52)	0.645 (0.39)	1.77 (0.78)
Number of obs.	248	171	419
$\bar{R}^2$	0.176	0.03	0.130
F-ratio	10.43*	1.10	5.58*
Standard error of estimate	8.084	7.25	7.76

Notes: For an explanation of the dummy variable technique, see Chapter 3, pp. 96-97.

D = 1 for primary manufactures

D = 0 for secondary manufactures

* = significant at the 5 per cent level

** = significant at the 10 per cent level

significant at the 10 per cent level. Therefore it can be concluded that there seems to be a difference in response between Canadian exports of primary and secondary manufactures to changes in transport costs, but the difference is not statistically significant. It is possible that the difference would have been significant, had more finished products been included among the secondary manufactures. Products such as sheet and strip steel, steel bars, nuts and bolts, copper tubing are probably fairly standardized, i.e. quality and design are fairly uniform between different manufactures.

The slope coefficient for the GNP variable was highly significant. This means that the structure of trade in primary manufactures is very much influenced by the variations in GNP between countries as compared to the structure of trade in secondary manufactures. This may indicate that a large GNP implies a large secondary manufacturing sector in the country. The secondary manufacturing sector then requires a large amount of primary manufactures as inputs which perhaps have to be purchased from abroad, i.e. from Canada.

There is some indication that Commonwealth preference is more important for Canadian exports of primary than secondary manufactures, but the difference is not statistically significant.

A Model with Distance instead of Transport Costs

The transport cost variable was deleted from model 3 (the final model) and a variable for distance (D_j), was inserted in its place. This was done to obtain some evidence on Linneman's speculation that distance through its psychological effect is more important as an obstacle to trade than transport costs.

The data for the distance variable were obtained from Table 17 in the appendix. If the commodity was mainly exported from the west coast (more than 50 per cent of shipments), distances from Vancouver to the major ports in other countries have been used (salmon, lumber, plywood). If the commodity was mainly exported from the east, distance from Montreal has been used.

In the previous studies using distance, the relevant distance has been that between the economic centres of the countries involved. It has been argued that the overall trade relations of a country are determined from the economic centre.[1] It was felt, however, that as Canada is so large, some attention should be given to whether production is centred in eastern or western Canada.

The estimated coefficients of the distance variable are presented in Table 15. The variable had the right sign for only twelve out of a possible twenty-six regressions. It was significant on the 5 per cent level for aluminum and on the 10 per cent level for tobacco and whiskey. Tobacco and whiskey had significant transport cost coefficients in the previously run regressions. The results from the regressions in the previous essay indicate that the freight rates of those commodities are influenced by distance (see Table 8). Therefore, it is likely that the effects of distance on the exports of tobacco and whiskey are caused by transport costs and not the psychological aspects of distance.

It should be noted that Gruber and Vernon's coefficients of the distance variable generally had the right sign and were in most cases significant, while the coefficients presented here are significant

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[1]Linneman, An Econometric Study of International Trade Flows, p. 29.

TABLE 15

RESULTS FROM REGRESSIONS ON MODEL 3, INCLUDING DISTANCE INSTEAD OF TRANSPORT COSTS

Commodity	Rel	Coefficient (-)	t-value
Frozen salmon	LL	3.258	0.534
Canned salmon	LL	-0.342	-0.085
Whiskey	LL	-3.449	-1.59**
Wheat Flour	LL	-2.118	-0.576
Tobacco	LL	-7.20	-1.40**
Hemlock	LL	-6.495	-0.702
Douglas Fir	LL	-0.693	-0.07
Plywood	L-LL	3516.19	0.86
Woodpulp	L	0.051	0.07
Newsprint	LL	3.239	0.80
Resins	L	-0.009	-0.25
Steel Bars	L	0.078	4.093
Sheet and Str.Steel	L	-0.065	-0.64
Aluminum	LL	-3.172	-1.83*
Copper	L	-1.596	-0.88
Copper tubing	L	0.015	0.21
Nickel	L	-0.033	-0.11
Nuts and bolts	L	0.011	3.625
Wire and Cable	L	0.034	2.09
Motor veh.	L	0.242	1.467
Aircraft eng.	L	0.0055	0.07
Agric. mach.	L	0.027	1.003
Constr. mach.	L	0.005	0.12
Aircr. assembly	L	-0.077	-0.40
Card punch mach.	L	0.057	1.17
Telephone app.	L	0.156	0.96

Notes: L = linear model

LL = double log model

L-LL = semi-log model (independent variables logarithmic)

** = significant at the 10 per cent level

* = significant at the 5 per cent level

in very few instances and frequently have the wrong sign.[1] There are three possible explanations for this difference in results: (1) different commodities, and regression equations, (2) Gruber and Vernon weighted land distances by a factor of two, (3) Gruber and Vernon did not study the exports of one country, but many bilateral trade flows. The distance variable in model 3 did not appear to be very sensitive to the specification of the regression equation. It gave uniformly "bad" results. Gruber and Vernon's commodities were generally secondary manufactures with a large portion of finished products. In Table 15, the regression coefficients for the secondary manufactures were even worse than those for the primary manufactures. Therefore it is not likely that either the selection of commodities or the regression equations explain the difference in results.

Another set of regressions was run, using distances to the economic centres of the importing countries. No improvement in the results was apparent. Therefore, the only explanations for Gruber and Vernon's results are that land distances were weighted, and that their study did not concentrate on the exports of one country.

Conclusion

Ocean transport costs are important in limiting the Canadian export trade of commodities such as canned salmon, whiskey, wheat flour, tobacco, douglas fir, hemlock, plywood, newsprint, steel bars,

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[1]Gruber and Vernon, "The Technology Factor in a World Trade Matrix," p. 259.

and sheet and strip steel, copper, nickel, and passenger automobiles.[1] Canadian exports of primary manufactures appear to be slightly more sensitive to variations in transport costs than those of secondary manufactures. It was argued that factors such as design, quality, delivery conditions, and guarantees may be more important than delivered price for the latter commodities.

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[1]As mentioned above, the coefficients for canned salmon, Douglas fir and steel bars were only significant at the 10 per cent level.

CONCLUSION

The empirical results presented in Chapters 3 and 4 necessitate a general discussion of the likely effect of the rate-making behaviour of the conferences on some of Canada's exports.

It was shown in Chapter 3, Table 7, that all conferences and independent operators practice price discrimination. The unit value of a commodity is taken as a guide to the elasticity of demand for its transportation. A relatively high value per ton is interpreted as a sign of low elasticity of demand for transportation. Therefore the high-valued commodity can bear a relatively high freight rate.

It is usually recognized that the unit value of the commodity is not an absolute indicator of this elasticity. The question is, however, whether it is even an approximate indicator. The transport cost elasticities presented in Chapter 4 (Table 13), and the unit values of the same commodities (Table 16, appendix) should cast some light on the matter.[1] The obvious procedure is to run a correlation between the elasticities and the unit values, but this is not permissible because of the mixture of elasticity coefficients derived from linear and log-linear relations. A correlation run on coefficients from the log-

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[1] It is easily seen that the estimated transport cost elasticities are also elasticities of demand for transportation. According to the estimated elasticities, a percentage increase in the freight rate leads to a certain percentage decrease in the quantity demanded for Canadian exports. Therefore it also causes the same percentage decrease in the quantity demanded of transport services in terms of tons carried.

linear relations only, or from the linear relations only, is not possible either because of the small number of observations. Therefore a comparison of rankings of commodities by unit values and by elasticities seems most appropriate.

A ranking of the elasticity coefficients estimated from the log-linear relations give the following ranking of commodities (starting with a relatively high elasticity): hemlock, newsprint, douglas fir, wheat, whiskey, canned salmon, tobacco. If the commodities are ranked according to increasing unit value instead, hemlock and wheat would change places, but otherwise the order would be the same. The elasticity ranking of the remaining commodities would be: passenger automobiles, sheet and strip steel, steel bars, copper, plywood, nickel. The same commodities ranked according to unit value would be: sheet and strip steel, steel bars, plywood, copper, passenger automobiles, nickel. That is the ranking changes more for the linear relations than for the log-linear relations. For example, the difference between the estimated elasticities of copper and plywood is not large (copper = -3.70, plywood = -3.11), while the difference in unit values is considerable (copper - 1090 dollars, plywood = 241 dollars). Passenger automobiles shows the largest elasticity of this group (-4.94), but has also the second highest unit value (1200 dollars). So the conclusion from this limited evidence would be that even though value sometimes gives an indication of elasticity of demand for transportation, it is by no means an adequate guide.

This would suggest that pricing according to value could be detrimental to Canadian exports. It is claimed, however, that the con-

ferences will in their own interest make exceptions to their pricing policy, if the resulting rate is too high for a commodity to move. As the conferences do not usually collect trade intelligence relating to their principal and most important commodities, it puts the onus on the shipper to inform the conferences of the competitive positions of their products.[1] Whether or not they are able to do so depends to some extent on their experience as exporters. It is likely that shippers of traditional export commodities, such as newsprint, have a fair idea of their relative competitiveness in the world market. On the other hand, a small firm, which is just starting to export, is less likely to have sufficient knowledge about the world market to be able to suggest a competitive freight rate to the conferences. Therefore it would be in the interest of both the conferences and the shippers if more information were available on competition in various export markets.

The results presented in Chapter 3, Table 8, indicate that the freight rates of some commodities, notably the bulky commodities, are more sensitive to changes in distance than others. These results, together with the elasticities in Table 13, show that particularly exports of canned salmon, whiskey, tobacco, douglas fir, and passenger automobiles suffer with increasing distance.

Quantity rebates were neither common nor substantial. For example, for whiskey, a 100 per cent increase in quantity shipped, leads to a reduction of the freight rate of 0.8 per cent. A reduction in the freight rate of 0.8 per cent causes an increase in Canadian exports of

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[1] Federal Maritime Commission, Fact Finding Investigation, p. 205.

7 per cent (Tables 8 and 13). For copper, a 100 per cent increase in quantity shipped leads to a freight rate reduction of 4 per cent and to an increase in exports of 12 per cent.

It was also found that joint operators are more likely to give quantity rebates than Canadian operators. As mentioned above, quantity rebates are given for two reasons: (1) to compete with tramps; (2) to benefit the shipper, as large quantities imply security of revenue for the conference. This advantage to the conferences of large quantities is apparently not passed on to the shippers if the conference is Canadian. According to the above results, small quantity rebates can have large effects on Canadian exports. Therefore it appears that this practice of the Canadian conferences is detrimental to those exports for which transport costs play an important role. If the findings of this study are correct, the onus falls on Canadian shippers to put more pressure on the Canadian conferences to give quantity rebates.

The results presented in Tables 8 and 9 show that competition from independent operators have an effect on freight rates. It is therefore also in the interest of Canadian exporters to promote competition on Canadian trade routes. Particularly the exports of canned salmon, whiskey, wheat flour, steel bars, and nickel appear to benefit from competition on the liner routes.

The final topic for discussion is the probable effect of containerization on the demand for selected Canadian export products. Of those exports which have been found sensitive to changes in transport costs, only whiskey and canned salmon (and possibly wheat flour) are suitable for containerization. However, whether or not containerization, by causing lower freight rates, will increase these exports depends

partly on the effect of containerization on Canada's competitive position in the export markets. For example, Canadian exports of whiskey to Australia are in direct competition with Scotch whiskey exported from Britain. British exports are likely to benefit from containerization as well, so the outcome depends on who benefits most.

The fact that the exports of commodities such as wire and cable, nuts and bolts, telephone apparatus, card punching machinery, do not appear to be sensitive to changes in transport costs does not mean that they could not benefit from containerization. Containerization leads to faster transport, and transport which suffers less from theft and damage. It is possible that such factors could have a beneficial effect on trade in these commodities.

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APPENDIX

TABLE 16

SELECTED COMMODITIES, THEIR UNIT VALUES, STOWAGE FACTORS, AND DEGREE OF MANUFACTURING

Canadian commodity code	Commodity	Unit value (dollars/ton)	Stowage cu.ft/ton	Degree of manufacturing
33-39,40,41 44,45	frozen salmon	1572	82	P
4 4-40,41,42,43 45	canned salmon	1690	46	P
62-69	wheat flour	103	40	P
173-40	whiskey	1671	59	P
180-05	unmanufactured tobacco	2240	107	P
331-38	lumber, Douglas Fir	532	63	P
331-43	lumber, Hemlock	541	69	P
335-44,59,72,79	plywood	241	67	P
340-19,20,25, 30,35,40,45,70 75,80,99	wood-pulp	130	58	P
351-09	newsprint	137	112	P
424-16,18	resins	302	53	S
444-30	bars, steel,hot rolled	216	31	S
445-30,40,55,99	sheet and strip steel	186	22	S
451-09	aluminum Pigs, ingots	508	22	P
452-04	copper,refinery shapes	1090	11	P
452-15	copper pipe and tubing	1285	50	S
454-15	nickel and alloys	2064	12	P
465-29	nuts,bolts,screws,washers	507	27	S
469-75	insulated wire and cable	1630	48	S
529-29	construction maint. mach. & parts	-	-	S
541 incl.549	agricultural machinery	-	-	S
580-19	passenger automobiles & chassis	1200	275	S
600-39	aircraft ass.eq. & parts	10100	99	S
634-19	telephone apparatus eq. & parts	3900	133	S
771-21	card punch.,sort.,tab., computers and parts	-	-	S

Sources: See text.

Notes: P = primary manufactures; S = secondary manufactures. The classification of commodities into primary and secondary manufactures is based on one used by the DBS.

TABLE 17

DISTANCES IN NAUTICAL MILES BETWEEN SOME CANADIAN AND FOREIGN PORTS

Foreign port	Montreal	Vancouver
London	3090	8830
Le Havre	2940	8600
Marseille	3870	9100
Cadiz (Spain)	3130	8360
Naples	4160	9380
Tel Aviv	5180	10410
Hamburg	3200	9140
Amsterdam	3160	8900
Copenhagen	3240	9210
Oslo	3160	9130
Stockholm	3660	9630
Sekondi (Ghana)	4810	8790
Capetown	7120	10500
Bombay	11800	9520
Calcutta	13460	8730
Yokohama	10850	4260
Sydney	10840	6820
Recife (Brazil)	4280	7290
Rio de Janeiro	5350	8360
Valparaiso	5790	5930
Callao	4520	4790
Jamaica	2620	4630
Port of Spain	2990	5230
Manila	11440	5940

Source: See text.

TABLE 18

CORRECTED FREIGHT RATES BETWEEN MAJOR CANADIAN PORTS AND SOME FOREIGN COUNTRIES (1969)
(dollars per short ton)

Commodity	United Kingdom			France, Belgium, Holl.			Germany		
	Mont.	Tor.	Van.	Mont.	Tor.	Van.	Mont.	Tor.	Van.
Frozen salmon	82.14	78.60	123.00	102.67	120.53	122.00	102.67	120.53	122.00
Canned salmon	26.34	25.67	78.00	39.73	43.30	77.00	39.73	43.30	81.00
Whiskey	47.67	51.94	108.00	54.57	57.86	106.00	54.57	57.86	135.70
Wheat flour	15.17	17.41	28.09	19.19	22.37	27.45	19.19	22.32	31.70
Unman. tobacco	36.60	38.39	n.a.	45.53	47.77	n.a.	45.53	47.77	n.a.
Douglas fir	29.01	31.47	open	42.85	44.64	53.84	42.85	44.64	53.84
Hemlock	34.37	37.94	open	48.21	51.79	59.40	48.21	51.79	59.40
Plywood	31.70	37.72	46.00	40.17	45.09	51.00	40.17	45.09	51.00
Woodpulp	41.40	42.80	open	24.55	26.34	open	24.55	26.34	open
Newsprint	19.64	21.43	55.00	22.32	26.33	54.00	22.32	26.33	57.00
Resins	28.12	30.58	43.08	30.80	35.71	41.96	30.80	35.71	44.42
Steel Bars	15.40	16.74	32.14	20.70	23.21	31.03	20.48	23.21	31.03
Sheet & strip steel	15.40	16.74	33.26	20.98	23.21	32.14	20.98	23.21	32.14
Alumin., ing.	n.a.	n.a.	21.87	22.32	26.34	21.87	22.32	26.34	21.87
Copper, ref. shapes	15.62	16.96	22.00	20.54	22.77	21.95	20.54	22.77	24.61
Copper pipe & tubing	62.72	67.19	63.12	55.80	59.37	62.49	55.80	59.37	62.49
Nickel	26.56	27.90	35.26	26.56	27.90	35.26	26.56	27.90	35.26
Nuts, bolts ..	52.90	56.47	n.a.	37.49	40.60	n.a.	37.49	40.60	n.a.
Wire and cable	46.87	48.66	97.00	77.79	81.01	96.00	77.79	81.01	110.40
Pass. auto.	190.13	191.56	517.86	188.50	201.50	516.07	188.50	201.50	516.07
Aircraft eng.	122.76	128.34	167.50	124.99	129.46	165.00	124.99	129.46	176.88
Aircraft ass.*	1.43	1.48	1.88	1.81	1.89	1.85	1.81	1.89	1.92
Constr. mach.*	0.80	0.83	1.16	0.83	0.89	1.14	0.83	0.89	1.14
Agric. mach.*	0.73	0.79	1.41	0.86	0.91	1.38	0.86	0.91	1.38
Telephone app.	267.21	273.15	291.27	240.73	251.37	287.28	240.73	251.37	305.90
General cargo*	(value	rates)	2.19	1.81	1.89	2.16	1.81	1.89	2.30

TABLE 18 (continued)

Commodity	Denmark			Sweden, Norway			Spain, Italy		
	Mont.	Tor.	Van.	Mont.	Tor.	Van.	Mont.	Tor.	Van.
Frozen salmon	98.21	107.19	122.00	98.21	107.14	124.00	86.61	104.46	147.00
Canned salmon	44.42	45.09	81.00	44.42	45.09	81.00	53.57	56.25	83.00
Whiskey	82.85	88.76	135.70	53.92	61.15	135.70	84.81	91.39	135.70
Wheat flour	29.69	33.26	31.70	29.69	33.26	31.70	47.32	49.11	37.50
Unman. tobacco	30.36	30.36	n.a.	30.36	33.93	n.a.	61.38	64.96	n.a.
Douglas fir	41.74	45.31	53.84	41.74	45.31	58.17	35.58	37.84	55.72
Hemlock	51.56	55.36	59.40	51.56	55.36	64.19	35.73	38.22	61.49
Plywood	54.46	55.80	51.00	54.46	55.80	54.00	53.12	47.77	54.00
Woodpulp	31.47	n.a.	35.50	31.47	n.a.	35.50	25.00	28.12	37.00
Newsprint	43.30	43.30	57.00	43.30	43.30	57.00	22.32	25.89	54.00
Resins	37.50	38.84	44.42	37.50	38.84	44.42	29.46	32.14	45.53
Steel Bars	36.13	37.56	31.03	36.13	37.50	33.25	35.64	36.83	34.15
Sheet & strip steel	26.56	29.24	32.14	25.45	28.12	34.60	open	open	35.27
Alumin., ing.	22.77	21.87	21.87	23.21	22.32	24.77	17.86	n.a.	25.86
Copper, ref. shapes	23.21	n.a.	24.61	23.21	n.a.	24.61	24.11	25.89	24.61
Copper pipe & tubing	53.79	57.37	62.49	53.79	57.37	65.33	62.18	64.39	62.49
Nickel	44.42	46.65	35.26	44.42	46.25	36.83	41.74	45.31	37.95
Nuts, bolts ..	35.27	39.73	n.a.	35.27	39.73	n.a.	35.04	36.83	n.a.
Wire and cable	78.60	85.04	110.40	78.60	85.04	110.40	84.77	93.08	110.40
Pass. auto.	178.75	186.88	516.07	178.75	186.88	519.42	284.38	307.13	516.52
Aircraft eng.	152.89	152.89	176.88	152.89	152.89	176.88	176.33	193.63	165.01
Aircraft ass.*	1.69	1.69	1.92	1.69	1.69	1.92	1.40	1.44	1.85
Constr. mach.*	0.84	0.84	1.14	0.89	0.89	1.14	1.29	1.34	1.26
Agric. mach.*	0.92	0.92	1.38	0.92	0.92	1.44	1.06	1.12	1.50
Telephone app.	243.39	263.34	305.90	243.39	263.34	305.90	263.34	288.61	305.90
General cargo*	1.83	1.98	2.30	1.83	1.98	2.30	1.98	2.17	2.30

TABLE 18 (continued)

Commodity	Israel			Australia			Brazil		Ghana
	Mont.	Tor.	Van.	Mont.	Tor.	Van.	Mont.	Tor.	Mont-Tor.
Frozen salmon	86.61	104.46	186.00	174.23	183.40	150.82	n.a.	n.a.	n.a.
Canned salmon	53.57	56.25	99.00	70.17	71.19	70.27	n.a.	n.a.	60.57
Whiskey	84.81	91.39	144.00	127.56	134.13	131.57	n.a.	n.a.	102.64
Wheat flour	47.32	49.11	44.64	49.33	n.a.	47.29	n.a.	n.a.	32.55
Unman. tobacco	61.38	64.96	n.a.	118.35	130.31	122.72	n.a.	n.a.	82.98
Douglas fir	35.58	37.84	67.58	73.45	n.a.	51.28	n.a.	n.a.	75.39
Hemlock	35.73	38.22	74.56	75.45	n.a.	51.28	n.a.	n.a.	83.17
Plywood	53.12	47.77	65.00	114.74	122.22	144.41	n.a.	n.a.	n.a.
Woodpulp	25.00	28.12	41.74	41.29	n.a.	39.73	32.33	35.71	32.32
Newsprint	26.79	30.36	66.00	41.96	n.a.	40.05	29.44	32.33	47.45
Resins	33.93	36.61	51.12	97.61	103.48	117.56	48.25	53.08	63.80
Steel Bars	35.04	36.83	40.62	31.47	31.47	30.16	29.44	32.53	33.12
Sheet & strip steel	open	open	41.74	29.91	29.91	30.16	29.44	32.33	33.92
Alumin., ing.	20.54	n.a.	37.50	35.04	n.a.	33.78	27.99	30.89	28.20
Copper, ref. shapes	24.11	25.89	26.11	44.42	48.88	38.12	30.89	33.78	n.a.
Copper pipe & tubing	50.50	52.71	69.75	90.90	92.93	69.67	n.a.	n.a.	n.a.
Nickel	41.74	45.31	48.21	46.42	50.89	44.39	61.28	66.11	n.a.
Nuts, bolts ..	35.04	36.83	n.a.	29.02	29.02	47.78	n.a.	n.a.	33.92
Wire and cable	84.77	93.08	117.29	89.02	89.02	59.16	52.78	55.02	71.62
Pass. auto.	284.38	307.13	522.32	204.75	221.00	319.71	256.47	281.06	293.71
Aircraft eng.	176.93	193.61	181.88	185.26	196.42	202.69	60.45	172.51	131.22
Aircraft ass.*	1.40	1.44	2.04	n.a.	n.a.	2.03	n.a.	n.a.	n.a.
Constr. mach.*	1.29	1.34	1.41	2.08	2.20	1.30	1.89	2.03	1.36
Agric. mach.*	1.06	1.12	1.38	1.28	1.41	1.23	1.19	1.31	1.47
Telephone app.	263.34	288.61	324.52	348.46	367.08	296.59	313.88	332.50	259.01
General cargo*	1.98	2.17	2.44	2.62	2.76	2.23	2.36	2.50	1.95

TABLE 18 (continued)

Commodity	Japan	India	South Africa		Trin.-Tobago		Jamaica		Peru-Chile
	Van.	Van.	Mon-Tor.	Van.	Mon-Tor.	Van.	Mon-Tor.	Van.	Van.
Frozen salmon	114.59	291.62	245.29	290.31	110.00	229.71	93.50	n.a.	290.86
Canned salmon	57.83	73.40	41.19	54.05	40.50	78.37	43.00	65.40	84.32
Whiskey	122.61	108.54	81.20	140.92	110.48	101.91	95.38	119.42	n.a.
Wheat flour	29.19	44.93	35.94	50.54	25.50	60.53	24.00	56.21	43.78
Unman. tobacco	n.a.	n.a.	256.30	n.a.	98.00	188.24	85.25	162.18	n.a.
Douglas fir	open	68.24	38.17	36.90	40.12	52.10	39.56	56.98	56.17
Hemlock	open	75.29	38.17	40.70	44.45	57.49	46.73	62.86	61.96
Plywood	62.64	54.94	50.08	33.54	55.00	66.48	57.25	67.56	58.37
Woodpulp	open	48.01	25.89	31.85	42.50	n.a.	36.75	n.a.	44.86
Newsprint	31.89	54.56	28.12	38.12	35.25	56.21	31.00	43.24	46.48
Resins	87.78	74.96	108.78	96.43	57.62	64.78	51.03	67.78	45.40
Steel Bars	33.78	40.80	41.96	30.39	39.50	45.94	36.75	51.35	45.40
Sheet & strip steel	n.a.	32.78	22.99	28.47	26.75	45.94	29.00	n.a.	45.40
Alumin., ing.	25.40	37.59	n.a.	27.99	39.50	78.91	25.00	68.10	72.43
Copper, ref. shapes	24.86	33.24	26.12	n.a.	71.50	86.48	76.00	75.67	59.46
Copper pipe & tubing	86.82	73.16	98.49	76.97	89.38	108.10	89.38	94.59	n.a.
Nickel	50.00	44.47	82.59	46.75	n.a.	87.28	n.a.	75.67	72.43
Nuts, bolts ..	36.44	45.85	41.96	45.36	36.25	45.94	39.25	51.35	45.40
Wire and cable	76.99	64.19	n.a.	113.69	62.00	74.71	57.50	n.a.	87.06
Pass. auto.	338.62	307.32	217.75	393.48	240.25	340.52	378.35	257.28	295.11
Aircraft eng.	208.09	151.86	172.42	139.85	n.a.	168.91	n.a.	167.56	186.47
Aircraft ass.*	2.08	n.a.	n.a.	n.a.	n.a.	1.50	n.a.	1.50	n.a.
Constr. mach.*	1.81	1.75	1.08	1.16	1.43	1.54	1.46	1.49	1.78
Agric. mach.*	1.53	1.58	1.50	2.29	1.29	1.76	0.96	1.46	1.28
Telephone app.	276.64	239.03	307.23	317.87	252.70	300.58	256.69	295.26	481.46
General cargo*	2.08	1.81	2.31	2.39	1.90	2.26	1.92	2.22	3.62

TABLE 18 (concluded)

Sources: Personal corresponcence (rates for South Africa, India, Trinidad-Tobago and Jamaica) and conference agreements filed with the Department of Industry, Trade and Commerce.

Notes: 1. Rates are usually quoted on a weight (wt) or a weight or measurement basis (w/m). In order to make all freight rates comparable they had to be converted to a uniform basis using stowage factors (Table 16). The unit chosen was Canadian dollars per short ton (2000 lbs.)

2. Starred commodities have rates expressed per cu. ft. since no stowage factors were available. These rates are therefore not comparable to the others.

3. Frequently, winter surcharges are levied on freight originating in Toronto or Montreal during January to March. These amount to approximately 5 per cent and have been ignored, since the amount of cargo loaded these months is small compared to the rest of the year.

4. Additional charges for receiving, stowing and delivery are quoted for the Montreal-Trinidad trade. These are included in the freight rates compiled in Table 19.

5. In those cases where two rates are quoted, one for packed cargo and one for unpacked cargo, the rate for packed cargo has been chosen.

TABLE 19
AVERAGE FREIGHT FACTORS FOR SELECTED COMMODITIES (1969)

Commodity	United Kingdom	France	Belg.-Lux.	Holland	Germany	Denmark	Sweden	Norway	Spain	Italy	Israel
Frozen salmon	6.33	7.58	7.50	7.39	4.82	7.44	7.63	6.71	5.93	8.24	9.99
Canned salmon	4.55	4.56	4.56	4.56	4.09	4.79	4.79	4.79	4.91	4.91	5.86
Whiskey	2.91	3.54	3.27	3.27	3.27	4.96	3.23	4.96	5.08	5.08	5.08
Wheat flour	14.73	18.63	18.63	18.66	18.63	30.09	28.83	28.82	45.94	36.41	43.34
Tobacco (unman.)	1.67	2.03	2.03	2.04	2.03	1.36	1.36	1.58	2.77	2.77	2.79
Douglas Fir	5.45	10.12	10.12	10.12	10.12	10.93	10.93	10.47	10.47	10.47	11.15
Hemlock	6.34	11.01	10.98	10.92	10.92	10.92	11.87	11.87	11.37	11.37	11.92
Plywood	19.17	21.24	21.16	21.16	20.49	21.16	22.41	22.41	22.41	22.41	26.97
Wood pulp	15.76	25.10	23.05	23.05	23.34	26.04	25.38	23.08	24.46	26.29	19.23
Newsprint	17.43	18.15	16.32	16.32	16.32	31.61	31.61	31.61	16.79	27.37	19.55
Resins	9.41	10.26	10.64	10.68	11.09	12.50	12.33	12.50	9.75	9.93	11.27
Steel bars	7.13	12.89	9.71	9.87	10.11	16.73	17.01	17.36	17.05	16.97	16.22
Sheet & Strip steel	8.61	12.48	12.48	11.28	12.15	14.28	15.12	15.12	15.05	15.05	15.05
Alumin. ing.	3.54*	4.10	4.31	4.39	4.39	4.48	4.57	4.48	3.52	3.52	4.04
Copper ref. shapes	1.44	1.89	1.88	1.89	1.89	2.13	2.13	2.13	2.29	2.21	2.25
Copper tubing	4.91	4.36	4.42	4.42	4.46	4.20	4.20	4.20	4.84	4.90	3.94
Nickel	1.28	1.34	1.71	1.64	1.63	1.71	2.15	2.15	2.02	1.84	2.20
Nuts & bolts	10.50	7.50	7.58	7.57	7.73	7.10	7.15	6.96	6.91	6.93	6.93
Wire & cable	2.88	4.85	4.83	4.83	4.88	4.85	4.88	4.82	5.20	5.22	5.24
Pass. auto.	15.96	16.08	16.23	15.71	15.56	14.90	14.90	15.00	23.70	25.59	25.59
Aircraft eng.	0.12	0.13	0.13	0.13	0.13	0.15	0.15	0.15	0.17	0.17	0.18
Aircraft ass.($/cu.ft)	1.44	1.81	1.83	1.83	1.85	1.69	1.69	1.69	1.40	1.40	1.40
Telephone app.	6.82	6.18	6.25	6.25	6.32	6.26	6.31	6.24	6.75	6.77	6.80
Constr. mach.($/cu.ft)	0.81	0.83	0.85	0.85	0.86	0.84	0.84	0.84	1.29	1.29	1.29
Agric. mach. ($/cu.ft)	0.73	0.86	0.88	0.87	0.89	0.92	0.92	0.92	1.06	1.06	1.06
Card punch mach.($/cu.ft)	-	1.81	1.83	1.83	1.85	1.83	1.85	1.83	1.98	1.98	1.98

TABLE 19 (continued)

Commodity	Aust-ralia	Brazil	Ghana	Japan	South Africa	Trin.-Tobago	Jamaica	Peru	Chile	India	The Phil-ippines
Frozen salmon	10.85	12.33	10.19	7.29	18.47	7.85	5.95	18.50*	18.50*	18.55*	7.29
Canned salmon	4.18	11.47	3.58	3.43	2.93	4.66	2.54	4.99*	4.99*	4.34*	3.42
Whiskey	7.63	8.32	6.14	7.34	4.86	6.61	5.71	12.77*	12.77*	6.55*	7.34
Wheat flour	47.89	92.04	31.60	28.34	34.89	27.67	32.09	42.50*	42.50	43.62	28.34
Tobacco (unman.)	5.28	11.29	3.70	9.98	11.44	4.67	3.81	17.31*	17.31*	8.94*	9.98
Douglas Fir	9.64	27.72	15.04	open	6.94	9.42	7.93	10.56	10.56	12.83*	open
Hemlock	9.48	30.08	16.32	open	7.52	10.26	9.08	11.45	11.45	13.92*	open
Plywood	59.92	65.57	54.18	25.99	17.91	27.59	28.03	24.22*	24.22*	22.80*	25.99
Woodpulp	30.56	24.87	24.87	open	21.38	38.08	28.27*	34.51	34.51*	36.93	open
Newsprint	30.14	21.49	34.65	23.28	20.53	31.28	22.63	33.93	33.93*	39.82	23.28
Resins	32.35	15.98	21.13	29.07	36.02	21.94	16.90	15.03*	15.03*	24.82*	29.07
Steel bars	14.12	14.50	15.70	15.64	19.43	21.04	17.01	21.02*	21.02*	18.89*	15.64
Sheet & strip steel	16.08	16.96	18.24	24.96	12.09	17.37	15.59	24.41*	24.41*	17.62*	24.96
Alum. ing.	6.69	5.51	5.55	5.00	5.51	8.93	4.92	14.25*	14.25*	7.40	5.00
Copper ref. shapes	3.84	2.83	1.92	2.28	2.40	7.10	6.97	5.46*	5.46*	3.05*	2.28
Copper tubing	7.05	9.19	7.59	6.74	7.66	7.59	6.96	14.09*	14.09*	5.69*	6.74
Nickel	2.19	2.97*	1.10	2.42	2.27	4.23	3.67	3.51	3.51	2.15	2.42
Nuts & bolts	5.72	12.47	6.69	7.19	8.28	8.30	7.74	8.95*	8.95*	9.04*	7.19
Wire & cable	5.46	3.24	4.39	4.72	6.97	4.29	3.53	5.34*	5.34*	3.94*	4.72
Pass. auto.	18.66	21.37	24.48	28.22	18.15	24.10	31.53	24.59*	24.59*	25.61*	28.22
Aircraft eng.	0.19	0.16	0.13	0.21	0.17	0.17*	0.19	0.19*	0.19*	0.15*	0.21
Aircraft ass. ($/cu.ft)	2.64	2.32	1.95	2.08	2.31	1.50	1.93	3.62*	3.62*	-*	2.08*
Telephone app.	8.94	8.05	6.64	7.09	7.88	7.02	6.58	12.35*	12.35*	6.13*	7.09
Constr. mach. ($/cu.ft)	2.09	1.89	1.36	1.81	1.08	1.59	1.46	1.78*	1.78*	1.75*	1.81
Agric. mach. ($/cu.ft)	1.30	1.19	1.47	1.53	1.50	1.45	0.96	1.28*	1.28*	1.58*	1.53
Card punch mach.($/cu.ft)	2.45	1.92	1.95	2.08	2.31	2.06	1.93	3.62*	3.62*	1.87*	2.08

TABLE 19 (Concluded)

Sources: Preliminary issue of the 1969 Shipping Report, Part 1: International Seaborne Shipping (DBS 54-202) and freight rates obtained from Department of Industry, Trade and Commerce and by private correspondence.

Notes: 1. Average freight factor: $\frac{100.\ \text{Average freight rate (\$/ton)}}{\text{f.o.b. unit value (\$/ton)}}$

2. Starred freight factors were not included in the analysis since in those cases freight rates were only available for one route while the Shipping Report indicates that exports follow several routes.

3. For additional information on these freight factors, see text.

TABLE 20
VALUE OF SELECTED CANADIAN EXPORTS (1969)
(thousands of dollars)

Commodity	United Kingdom	France	Belg.-Lux.	Holland	Germany	Denmark	Sweden	Norway	Italy
Frozen salmon	* 4,160	6,272	574	757	603	612	381	201	290
Canned salmon	* 21,343	444	2,156	433	98	103	52	-	466
Whiskey	108,631	131	378	140	744	86	145	22	155
Wheat flour	4,389	1	293	6	1	-	-	1	43
Unmanuf.tobacco	54,320	26	111	401	46	317	-	136	-
Lumber,Douglas Fir	4,083	2,130	2,606	1,117	1,093	-	-	-	5,694
Lumber, Hemlock	14,360	4,279	617	913	1,090	-	-	-	1,566
Plywood	31,693	1,823	421	3,536	2,257	2,124	574	422	5
Woodpulp	* 36,585	16,862	6,435	18,074	34,725	131	-	-	23,965
Newsprint	60,616	260	545	1,284	7,617	-	-	-	9
Resins	1,552	12	98	759	1,088	127	84	185	1
Steel bars	531	3	69	1	17	-	-	40	8
Sheet & strip steel	* 4,657	65	79	97	432	217	308	19	435
Alumin. pigs & ing.	73,192	1,624	3,489	5,340	14,394	2,754	86	63	6,041
Copper, ref. shapes	90,720	17,315	2,025	2,268	12,384	-	935	-	2,323
Copper pipe & tubing	971	-	96	37	-	-	-	51	11
Nickel & alloys	21,817	2,033	513	80	791	21	57	34	4,039
Nuts,bolts,screws & wash.	29	6	4	14	3	1	4	-	-
Insulated wires & cable	88	10	3	2	28	-	6	-	3
Pass. autom. & chassis	1,562	34	1,654	775	110	168	427	54	42
Aircraft engines & parts	1,304	1,637	103	902	593	37	3	1,270	225
Aircraft assembly	1,046	2,683	152	6,226	1,973	62	63	310	806
Telephone app. & equip.	57	10	4	8	16	124	106	278	-
Constr. maint. mach.	130	476	81	81	74	69	9	-	58
Agricultural implem.	* 1,130	485	22	343	22	2	128	1	7
Card punch.,tab. mach.	5,553	1,101	116	529	1,611	17	687	2	839
Total exports of sel.com. to each country	446,749	59,710	22,546	43,356	81,810	7,044	4,055	2,814	47,031
Total ex.to each country	1,096,480	124,708	116,232	184,966	277,382	15,010	41,270	103,645	133,671
Sel. exp.as % of total exp.	40.74	47.87	19.39	23.43	29.49	46.92	9.82	2.71	35.18

TABLE 20 (continued)

Commodity		Spain	Israel	Aust-ralia	Brazil	Ghana	Japan	South Africa	Trin.-Tob.	Jamaica
Frozen salmon	*	-	10	100	-	-	1,679	66	-	15
Canned salmon	*	11	4	790	5	2	24	458	255	162
Whiskey		64	15	116	5	-	274	165	12	96
Wheat flour		-	189	-	-	1,966	22	-	1,739	254
Unmanuf. tobacco		-	21	33	-	-	-	-	454	46
Lumber, Douglas Fir		333	10	10,106	-	-	1,337	2,830	86	-
Lumber, Hemlock		70	-	2,140	-	-	26,667	2,307	14	-
Plywood	*	1	-	68	-	-	321	104	136	223
Woodpulp		3,096	-	9,344	196	-	62,330	1,963	-	-
Newsprint		1,440	-	22,315	4,220	-	18,581	2,955	686	955
Resins		80	20	581	-	-	-	636	-	5
Steel bars		7	-	1,062	109	-	1	42	2	42
Sheet & Strip Steel	*	529	918	1,399	818	-	-	679	9	259
Alumin. pigs & ing.		10,235	1,569	1	9,451	-	60,738	21,705	2	201
Copper, ref. shapes		842	4	-	2,903	-	3,592	3,875	2	-
Copper pipe & tubing		181	833	8	-	-	-	281	10	1
Nickel & alloys		37	50	3,086	679	-	854	-	4	-
Nuts,bolts,screws & wash.		3	10	177	-	-	-	34	16	22
Insulated wire & cable		-	20	43	1	7	14	72	40	150
Pass. autom. & chassis		2	16	561	116	7	75	6,954	183	518
Aircraft engines & parts		331	349	1,098	1,237	13	192	1,084	-	211
Aircraft assembly		94	11	712	172	37	263	191	5	44
Telephone app. & equip.		1	-	17	135	-	8	2	907	5,018
Constr. maint. mach.		267	16	1,019	23	-	21	95	3	13
Agricultural implem.	*	18	3	924	575	1	324	598	49	8
Card punch., tab. mach.		153	18	514	1,244	-	3,873	25	3	16
Total exports of sel. com. to each country		17,795	4,086	55,753	21,889	2,033	169,773	47,122	4,617	8,250
Total ex. to each country		55,908	16,975	163,258	42,128	5,100	624,837	78,513	19,492	40,481
Sel. exp. as % of total exp.		31.82	24.07	34.15	43.56	39.86	27.17	60.01	23.68	20.37

TABLE 20 (continued)

Commodity		Peru	Chile	India	The Philippines	Total Cdn. exports of each com. to countries incl.	Total Cdn. exports of each commodity	Sample as % of total Cdn. exports of each com.
Frozen salmon	*	-	-	-	-	14,963	23,316	64.17
Canned salmon	*	-	-	2	7	26,815	29,767	90.08
Whiskey		1	2	1	10	110,815	189,074	58.60
Wheat flour		2	-	1	8	8,915	51,715	17.23
Unmanuf. tobacco		-	-	-	-	55,800	58,875	94.77
Lumber, Douglas Fir		31	-	-	-	28,850	116,620	24.73
Lumber, Hemlock		6	-	-	-	54,029	143,040	37.77
Plywood	*	-	-	-	-	43,708	50,784	86.10
Woodpulp		739	-	1,102	661	216,208	753,328	28.70
Newsprint		3,538	185	8,519	6,124	139,889	1,125,801	12.42
Resins		49	-	-	-	5,277	7,997	65.98
Steel bars		8	37	36	-	2,015	16,254	12.40
Sheet & strip steel	*	1,624	89	11	39	12,683	67,112	18.89
Alumin. pigs & ing.		849	1,754	731	110	214,329	450,155	47.61
Copper, ref. shapes		-	-	-	1	139,189	229,029	60.80
Copper pipe & tubing		38	-	26	448	2,992	20,507	14.59
Nickel & alloys		1	133	1,208	30	35,467	215,116	16.48
Nuts, bolts, screws & wash.		-	2	30	16	371	14,505	2.60
Insulated wires & cable		41	47	213	812	1,600	27,207	5.90
Pass. autom. & chassis		4,956	3,522	20	4,711	26,468	1,794,742	1.50
Aircraft engines & parts		160	301	602	145	11,797	102,718	11.48
Aircraft assembly		14	252	148	3	15,267	152,765	10.00
Telephone app. & equip.		55	36	74	6,395	13,254	53,412	24.82
Constr. maint. mach.		7	164	63	1	2,674	23,803	11.20
Agricultural implem.	*	5	112	2	8	4,767	155,987	3.10
Card punch., tab. mach.		106	10	73	60	16,551	58,717	28.20
Total exports of sel.com. to each country		12,230	6,652	12,842	19,584			
Total ex. to each country		26,234	22,837	95,552	32,328			
Sel. exp. as % of total exp.		46.61	29.12	13.43	60.59			

TABLE 20 (Concluded).

Source: DBS, Exports by Commodities, Dec. 1969.

Notes: Starred commodities are aggregated over several commodity classes. For detailed information on the aggregated classes, see Table 16.

TABLE 21

CUSTOMS RATES CALCULATED AS PERCENTAGES OF F.O.B. VALUE (1969)

Commodity	United Kingdom	France	Belg.-Lux.	Hol-land	Germany	Denmark	Sweden	Norway	Spain	Italy	Israel
Frozen salmon	0	9.90	9.90	9.90	9.60	0	0	0	15.90	9.60	6.49
Canned salmon	0	15.47	15.47	15.47	15.41	3.88	1.25	5.03	27.80	15.52	53.99
Whiskey	0	36.24	36.14	36.14	36.14	18.47	12.63	24.60	35.20	36.78	47.28
Wheat flour	0	35.58	35.58	35.60	35.58	0	0	0	55.60	40.92	0
Tobacco	760.70	26.52	26.52	26.53	26.52	0	2.03	0	0	26.70	11.92
Douglas fir	0	0	0	0	0	0	0	0	2.21	0	20.00
Hemlock	0	0	0	0	0	0	0	0	2.22	0	20.14
Plywood	0	16.97	16.97	16.97	16.87	0	5.87	18.36	22.64	17.14	31.74
Woodpulp	0	6.00	5.91	5.91	5.92	0	0	0	12.45	6.06	0
Newsprint	0	9.45	8.14	8.14	8.14	0	0	3.95	10.51	8.92	47.82
Resins	0	8.16	8.19	8.19	8.22	9.90	14.04	26.98	26.34	8.14	22.25
Steel Bars	0	7.90	7.68	7.69	7.71	0	7.02	0	17.56	8.18	0
Sheet & strip steel	0	9.00	9.00	8.90	8.97	0	0	0	17.26	9.20	0
Alumin. ing.	0	14.36	14.39	14.41	14.41	0	3.13	0	20.70	14.28	0
Copper ref. shapes	0	9.37	9.37	9.37	9.37	0	3.06	0	17.39	9.40	0
Copper tubing	0	9.60	9.60	9.60	9.61	5.21	3.13	5.21	17.82	9.65	15.59
Nickel	0	5.06	5.09	5.08	5.08	0	0	0	4.59	5.09	0
Nuts and bolts	0	12.68	12.69	12.69	12.71	8.57	7.72	8.56	21.38	12.62	21.38
Wire and cable	0	16.98	16.98	16.98	16.99	0	6.29	3.14	29.46	17.04	15.79
Pass. auto.	15.66	17.41	17.43	17.36	17.33	13.78	14.93	10.58	74.22	18.84	12.56
Aircraft eng.	16.19	8.10	8.10	8.10	8.10	0	3.12	16.24	0	8.14	0
Aircraft ass.*	0	8.00	8.00	8.00	8.00	0	9.60	0	9.50	8.00	0
Telephone app.	0	11.26	11.26	11.26	11.26	7.65	8.50	15.30	21.35	11.32	64.07
Construction mach.*	0	12.10	12.10	12.10	12.10	9.00	18.00	8.00	7.50	12.10	25.00
Agric. mach.*	0	7.40	7.40	7.40	7.40	0	8.00	8.00	16.00	7.40	0
Card punch mach.*	0	8.20	8.20	8.20	8.20	0	8.00	8.00	0	8.20	5.00

TABLE 21 (continued)

Commodity	Aust-ralia	Brazil	Ghana	Japan	South Africa	Trin.-Tobago	Jamaica	Peru	Chile	India	Philip-pines
Frozen salmon	1.00	67.39	6.17	8.58	10.54	1.07	0	71.10	201.45	41.49	48.28
Canned salmon	0	111.46	5.48	18.61	2.40	5.23	5.13	101.84	323.37	20.87	15.51
Whiskey	80.00	162.48	49.35	49.38	141.50	201.50	156.44	225.53	259.36	181.04	107.34
Wheat flour	59.00	115.22	104.25	32.08	1.35	0	14.13	42.75	242.26	0	19.25
Tobacco	234.00	166.93	158.67	390.40	24.52	151.77	311.42	35.20	293.28	294.15	109.98
Douglas fir	0	76.63	115.04	0	0	2.41	6.47	37.59	154.78	56.41	n.a.
Hemlock	0	78.05	116.32	0	0	2.42	6.54	37.89	156.03	22.78	n.a.
Plywood	47.50	165.57	154.17	22.68	29.51	19.14	12.80	478.25	198.75	42.98	125.99
Woodpulp	0	37.46	12.49	0	0	20.71	11.54	40.35	47.08	27.30	n.a.
Newsprint	0	97.19	0	9.02	0	0	18.39	26.78	187.50	69.91	30.82
Resins	50.00	69.59	90.84	20.65	20.40	12.19	11.69	23.01	92.02	31.21	12.90
Steel Bars	0	57.25	57.85	14.80	3.58	18.16	0	217.83	60.51	29.72	69.38
Sheet & strip steel	0	58.48	59.11	15.93	3.36	17.60	0	37.32	62.20	11.76	43.73
Alumin. ing.	25.00	52.75	52.77	23.10	0	16.34	10.49	34.27	68.55	37.59	42.00
Copper ref. shapes	12.50	10.28	50.96	18.41	0	10.71	0	66.65	69.60	0	20.46
Copper tubing	0	54.59	0	19.21	0	16.14	0	85.56	114.08	42.28	10.67
Nickel	0	10.30	50.55	24.58	0	15.63	15.55	31.05	46.58	0	10.24
Nuts and bolts	12.00	67.48	53.34	13.61	3.25	16.25	16.16	54.48	167.79	59.97	53.59
Wire and cable	17.50	82.59	52.19	21.99	5.35	15.64	15.53	47.40	47.40	36.38	20.94
Pass. auto.	27.50	121.37	49.79	35.90	53.16	31.02	52.61	99.67	398.69	188.41	44.88
Aircraft eng.	27.50	2.03	0	24.49	0	25.42	0	20.37	40.74	3.04	10.21
Aircraft ass.*	30.00	2.00	15.00	15.00	0	25.00	0	20.00	40.00	3.00	10.00
Telephone app.	12.50	64.83	0	13.65	5.39	16.05	0	40.44	74.14	37.14	16.06
Construction mach.*	27.50	40.00	0	12.20	0	2.50	0	20.00	35.00	20.00	10.00
Agric. mach.*	30.00	40.00	0	12.20	0	0	0	20.00	45.00	0	15.00
Card punch mach.*	0	80.00	50.00	12.25	5.00	20.00	15.00	30.00	135.00	20.00	15.00

TABLE 21 (concluded)

Source: Various issues of the International Customs Journal

Notes: 1. Ad valorem duties are usually quoted on a c.i.f. basis (exception: Australian duties). The rates were converted to an f.o.b. basis by the following formula:

$$T_1 = \frac{(U + F_1)\, T_2}{U}$$

Where T_1 = ad valorem duty expressed as a percentage of f.o.b. unit value

T_2 = ad valorem duty expressed as a percentage of c.i.f. unit value

F_1 = freight rate ($/ton)

U = f.o.b. unit value ($/ton)

2. The unit values for the starred commodities were not available. Therefore their duties are expressed as percentage of c.i.f. values.

TABLE 22

GNP AND PER CAPITA GNP FOR SELECTED COUNTRIES, 1968

Country	GNP (bill.Can.Doll.)	Per capita GNP (thous.Can.doll.)
United Kingdom	102.60	1.85
France	112.47	2.23
Belgium-Luxemburg	21.60	2.16
The Netherlands	25.20	1.96
Germany	143.98	2.48
Denmark	112.41	2.55
Sweden	25.58	3.21
Norway	9.01	2.36
Spain	25.18	0.764
Italy	74.25	1.41
Israel	4.05	1.48
Australia	23.82	1.98
Brazil	29.63	0.326
Ghana	2.08	0.248
Japan	142.75	1.412
South Africa	7.18	0.375
Jamaica	0.601	0.589
Trinidad-Tobago	0.934	0.489
Peru	5.6	0.425
Chile	6.0	0.627
India	40.3	0.075
The Phillippines	7.2	0.194
Canada	71.43	3.38

Source: International Financial Statistics

TABLE 23

PRODUCTION OR EXPORTS OF SELECTED COMMODITIES BY SELECTED COUNTRIES (1968)

Commodity	United Kingdom	France	Bel-Lux.	Holland	Germany	Denmark	Sweden	Norway	Spain	Italy	Israel
Fish catches	1040	794	68	323	682	1467	315	2804	1503	363	26
Wheat flour			707	703	3060	187	364		3970		313
Tobacco		15128	6648	14700	8679	3479	1236	4343	2500	3406	116
Distilled alc. bev.*(112.4)	455144	144965	300	11381	3334	4817	156	62	4106	7684	
Sawn wood	586		285	255	1695		257	28	650	1684	
Mech. & chem woodpulp	375	1540	315		1560		7000	200	430	790	
Newsprint	735	417	98	183	284		809	474	135	360	
Plastics & resins	1263	1008		761	3256		335		170	1399	27
Crude Steel	26277	20410	11573	3707	41159	457	5061	824	4940	16964	
Primary Alum.	38	366	2	49	257		56	470	95	142	
Copper, worked	198	36	341		407		47	18	86	18	
Nickel, all*(683.1)	74364	14583	135	3360	3608		1330	63079		127	
Steel, copper nuts, bolts *(694.2)	18246	17370	6884	8576	52831	923	8036	1391	1992	21199	
Insul.wire & cable (723.1)	102288	48129	18290	20843	81064	2240	12124	1903	3702	24063	
Plywood * (631.2)	965	11346	4897	4456	10772	2029	783	104	3436	19562	
Motor veh.prod.	1816	1833		58	2862		224		319	1545	
Line Tel.eq.* (724.91)	80238	29833	44128	22646	129725	2757	13913	2744	3751	19933	
Aircraft eng. incl.jet*(711.4)	352360	70879	29790	37299	51032	11129	4115	534	145	10121	
Excav.level mach.* (718.42)	173350	119188	31308	11365	158322	5367	27584	5169	1534	52847	
Cultiv.harvest mach.(712.122)	65130	42566	50258	20440	174199	23830		10669	3792	29140	
Stat.mach.*(714.3)	61233	124027	1872	3741	66216		6030		51	67923	

TABLE 23 (Continued)

Commodity	Aust-ralia	Brazil	Gh na	Japan	South Africa	Trin.-Tob.	Jamaica	Peru	Chile	India	Philli-pines
Fish catches	103	400	102	8670	1133		17	10520	1376	1526	945
Wheat flour	1254			3349	658					1253	
Tobacco	3384		612	662	11748	9					
Distilled alc. bev.*(112.4)	980			1041							
Sawn Wood		3100	310	8076					249		
Mech. &Chem. woodpulp	510	636		6860					279		
Newsprint	94			1471					116		
Plastics & resins	170	89		3413						37	
Crude steel	6502	4436		66893	4002			84	526	6447	
Primary aluminium	97	41	124	481						120	
Copper, worked	108	3		548	63			38	315	10	
Nickel, all.* (683.1)											
Steel, copper nuts, bolts *(694.2)	915			53941							
Insul. wire & cable* (723.1)	1748			46314							
Plywood *(631.2)	531			93032							
Motor veh. prod.	330	170		2056						45	
Line Tel eq. * (724.91)	815			23928							
Aircraft eng. incl. jet* (711.4)	181			3328							
Excav. level. mach.* (718.42)	4095			3369							
Cultiv. harvest mach. (711.122)	6295			12997							
Stat. mach.*(714.3)	246			14008							

TABLE 23 (Concluded)

Sources: United Nations. Yearbook of Statistics, 1969 and World Trade Annual, 1968.

Notes: All starred commodities contain export data; all others production data. Export data are obtained from the World Trade Annual. Statistics in this publication are not kept for the developing nations. The exports for these countries have been assumed to be zero. The unit of measurement is thousands of US dollars. Figures within brackets refer to the SITC classification. The data for wheat flour are in millions of metric tons; the data for sawn wood in thousands of m^3; for passenger automobiles in thousands of units. All others, with the exception of starred commodities are in thousands of metric tons.

TABLE 24

SAMPLE PAGE OF A CONFERENCE RATE SCHEDULE

AMERICAN MAIL LINE LTD. - PACIFIC/INDIA FREIGHT TARIFF NO. 3 - FMC-8					Orig/Rev. 9th	Page 23
					Cancels 8th	Page 23
FROM: Pacific Coast Ports named on the Title Page hereof	TO: Bombay, Calcutta, Karachi (Group 1) Chalna, Chittagong, Cochin, Madras (Group 2) Colombo, Ceylon (Group 3) and to other ports, named on Pages 58 thru 71				Effective Date January 1, 1970	Corr. No. 213
Except as otherwise provided rates apply per 2,000 lbs. or 40 cubic feet whichever produces the greater revenue.						
COMMODITY CODE	COMMODITY DESCRIPTION AND PACKAGING	RATE BASIS	GROUP 1	GROUP 2	GROUP 3	ITEM NO.
			(A)	(A)	(A)	
	ACID, viz:					5
	Acetic: Commercial, Glacial and Acetic Anhydride		75.50	79.50	90.50	
	Hydrochloric		98.75	102.75	118.50	
	Muriatic		101.50	105.50	121.75	
	Nitric (On Deck)		101.50	105.50	121.75	
	Sulphuric (On Deck)		101.50	105.50	121.75	
	Phosphoric	LT/40	52.25	56.25	62.75	
	AD VALOREM CARGO - See Rule #16					
	AGRICULTURAL IMPLEMENTS AND PARTS...............		61.25	65.25	73.50	10
	AIR CONDITIONERS; AIR CONDITIONING MACHINERY AND PARTS, N.O.S.		58.00	62.00	69.50	12
	AIRPLANES AND PARTS...........................	LT/M	66.25	70.25	79.50	15
	ALCOHOL, DIACETONE............................		105.75	109.75	127.00	17
	ALKANE, DETERGENT ALKALATE; ALKYL BENZENE, in Drums....................................		54.75	58.75	65.75	19
	ALKANE, DETERGENT ALKALATE; ALKYL BENZENE, in Bulk.....................................	LT/ 910	48.75	52.75	58.50	20
	ALUMINUM AND ALUMINUM GOODS, viz:					21
	NOTE: Rates named to Group 2 Ports apply via direct call. Transhipment rates $6.00 per ton higher.					
	Bars, Pigs and Slabs...........................	LT	41.00	45.00	49.25	
	Cable and Accessories..........................	LT	50.25	54.25	60.25	
	Circles..	LT/M	52.50	56.50	63.00	
	Rods, including re-draw........................	LT/M	44.25	48.25	53.00	
	Sheets, Shot, Strip............................	LT	52.50	56.50	63.00	
	Wire Screen Cloth; Castings; Joints............	LT/M	61.00	65.00	73.25	
	Ingots...	LT	38.25	42.25	46.00	
	(D)					
	Wire, on Reels r in Coils.....................	LT/M	46.75	50.75	56.00	
	(Vessels may call at Kitimat, B.C. for direct loading subject to a minimum quantity of 750 revenue tons, however, vessels calling to load for ports outside the scope of this tariff may load any quantity for ports covered by this tariff.)					

For Explanation of Reference Marks and Abbreviations See Page No. 5